



DR. H.R.J. GROSCH, editorial director

EDWARD J. BRIDE, editor

V.J. FARMER, managing editor. **RONALD A. FRANK**, technical news editor. **E. DRAKE LUNDELL JR.**, computer industry editor. **MARVIN ARONSON**, assistant managing editor. **DONALD LEAVITT**, software editor. **MICHAEL WEINSTEIN**, systems editor. **MARY UPTON**, financial editor and assistant computer industry editor. **LESLIE FLANAGAN**, **JUDITH KRAMER**, copy editors. **PATRICK G. WARD**, **TONI WISEMAN**, **MARGUERITE Y. ZIENTARA**, staff writers.

ALAN TAYLOR, **J. DANIEL COUGER**, **FRANK GREENWOOD**, columnists. **E. DRAKE LUNDELL JR.**, Washington bureau. **MARVIN SMALHEISER**, West Coast bureau. **J.H. BONNETT**, European bureau. **HIDETSUNA SASAKI**, Asian bureau.

NEAL WILDER, vice president - marketing. **DOROTHY TRAVIS**, marketing administrator. **JUDY MILFORD**, advertising coordinator. **KATHRYN V. DINNEEN**, market research. **LEETE DOTY**, production manager. **HENRY FLING**, production supervisor.

W. WALTER BOYD, publication manager. **PATRICK J. McGOVERN**, publisher.

EDITORIAL OFFICES: 797 Washington St., Newton, Mass. 02160. Phone: (617) 332-5606. Telex: 92-2529. **Washington**: Room 1129, National Press Bldg., Washington, D.C. 20004. Phone: (202) 638-0901. Telex: 89-544. **Los Angeles**: 963 N. Edgecliff Drive, Los Angeles, Calif. 90026. Phone: (213) 665-6008. **Europe**: Computerworld, c/o IDC Europa Ltd., 59 Grays Inn Rd., London, W.C.1, England. Phone: 01-242-8908. **Asia**: Computerworld, c/o Shukan Computer, Dempa Building, 1-11-15, Higashigotanda, Shinagawa-ku, Tokyo 141. Phone: (03) 445-6101. Telex: 26792.

Second-class postage paid at Boston, Mass., and additional mailing offices. Published weekly (except: a single combined issue for the last week in December and the first week in January) by Computerworld, Inc., 797 Washington St., Newton, Mass. 02160. © 1973 by Computerworld, Inc.

Reproduction of material appearing in Computerworld is strictly forbidden without written permission. Send all requests to publication manager.

Computerworld can be purchased on 35mm microfilm in half-volumes (six-month periods) through University Microfilm, Periodical Entry Dept., 300 Zeeb Rd., Ann Arbor, Mich. 48106. Phone: (313) 761-4700.

25 cents a copy; \$9 a year in the U.S.; \$10 a year in Canada; all other foreign, \$25 a year. **MARGARET PHELAN**, circulation manager. Four weeks' notice required for change of address. Address all subscription correspondence to circulation manager, Computerworld, 797 Washington St., Newton, Mass. 02160.

COMPUTERWORLD, INC.
 Patrick J. McGovern..... president
 W. Walter Boyd..... executive vice president
 Robert M. Patterson..... vice president-int'l.
 T. Neal Wilder..... vice president-marketing

BPA **ABP** **AIA**

POSTMASTER: Send Form 3579 (Change of Address) to Computerworld Circulation Dept., 797 Washington St., Newton, Mass. 02160.

ATTACH LABEL HERE for address change or inquiry. The code line on top may not mean much to you, but it is the only way we have of quickly identifying your records. If you are receiving duplicate copies, please send both labels. Please let us know four weeks before you plan to move. List new address below and include a current mailing label or your old address.

First Initial	Middle Initial	Surname					
Your Title				August 29, 1973			
Company Name							
Send to: Address					State	Zip Code	
City							

Address shown is: Business Home Check here if you do not want to receive promotional mail from Computerworld.

COMPUTERWORLD Circulation Department
 797 Washington St., Newton, Mass. 02160

Government Probing Operations of EDS

(Continued from Page 1)

Data Systems Federal Corp. (EDSF) was \$6.2 million a year, McDonnell Douglas Automation Co. bid \$5.9 million and University Computing Co. came in with the low bid of \$5.3 million.

In addition, the GAO also charged Nationwide had changed the specifications on the contract to favor the Perot firm after the bidding had started.

"Notwithstanding Nationwide's adjustments, its cost evaluation concluded that UCC's proposal produced the lowest cost, McDonnell Douglas produced the next lowest and EDSF's produced the highest," the GAO report said.

However, Nationwide awarded the contract to Perot's firm "because of its past performance record and other factors," according to the report.

New York Investigation

Perot's main firm, Electronic Data Systems, is also under attack by Rep. Benjamin Rosenthal (D-N.Y.), who has claimed that the firm used "questionable marketing tactics" in order to get a contract with New York State.

The award in question is only for

Your Mission, Geof, Crack That Security

PALO ALTO, Calif. - Though Tymshare had its troubles with one youth's enthusiasm for computers, the firm has hired another 15-year-old high school student for the summer and told him to try and crack its security software.

Geof Mulligan, who claims an IQ of more than 150, said he is a "hired computer burglar" whose mission is to get by security defenses and tap confidential data from Tymshare's computer system.

Geof, who took a Fortran course at Stanford and knows Basic and Cobol as well, spends as many as 14 hours daily at a terminal in the bedroom of his home. Tymshare provided him with the terminal at no charge. Geof receives no pay from Tymshare but works for "the fun of it" and what he learns.

Geof has access to four Tymshare computers through his terminal. After reaching one of them, he gives his code name and starts experimenting.

"Mainly I just try to think of things that Tymshare may not have thought of, and of places that they haven't blocked yet," said the student who wants to be a systems programmer.

So far Geof hasn't managed to crack the computer's security, but he's working at it.

Tymshare "really set it up beautifully," Geof remarked. Although he remains a frustrated computer burglar, so far he said he has learned a lot from his efforts.

\$125,000 for a computer consulting contract, but Rosenthal said it could be a forerunner of over \$30 million in medical and welfare computer work in the state.

The contract was reportedly made after Perot, a heavy contributor to Republican causes, made a visit to Gov. Nelson Rockefeller, even though federal officials had opposed awarding the contract to the Perot firm.

In a letter to the governor, Rosenthal said the GAO would make a study of the award, along with the Federal Trade Commission and the Antitrust Division of the Justice Department. Rosenthal has also asked for an investigation by the House Intergovernmental Relations Subcommittee, which commissioned the GAO report on the West Virginia and Ohio contract.

Rosenthal charged that the circumstances surrounding the award of the New

York pact "follow an all-too-familiar pattern established elsewhere by EDS: the circumvention of normal and orderly procurement processes and the avoidance of open competition by the utilization of questionable marketing tactics."

Perot's firm has prospered through Medicare and Medicaid contracts, with its first major pact coming shortly after it was founded in 1968 from Blue Cross of Texas for handling Medicare in that state.

That contract, and several others held by EDS, came under strong attack in 1971 before the House Intergovernmental Relations Subcommittee headed by L.H. Fountain (D-N.C.).

In those hearings, one Social Security computer expert estimated the profits for computer work on Medicare contracts were running around 100%, and said the profit on the contract that EDS had with Texas Blue Cross produced a profit of 200%.

There's a Mini in IBM's Future

(Continued from Page 1)

forward," the group said, "but carries higher than normal risk. While it is the S/3 replacement family, it will be based on new architecture and requires improved D(data) Processing I/O."

The management committee decided the real risk would be timing of its introduction, but it added the "technology gating factor" would be the development of the "Gulliver file," apparently a new large disk file for smaller systems.

Top management decided to go ahead with the project, although both the marketing department of the firm and World Trade disagreed with the decision in favor of a smaller S/3 in the short term and the introduction of the new family in 1976.

"There is no doubt that the lack of a low-end system will impact our new ac-

count potential and make our unit record inventory, particularly abroad, very vulnerable," the management committee noted, indicating that "World Trade believes it will lose one-fourth of its unit record installations to competition by 1976.

"Nonetheless," the management committee reaffirmed its commitment to the new system noting, "We recognize the adverse consequences on the low end of the line, but feel there is no evidence that we can produce a low-cost system with reasonable profit" prior to its development. "All of the evidence is on the other side," it said.

CW on Microfilm

NEWTON, Mass. - Computerworld is now available on microfilm to facilitate storage.

Six reels of 35mm microfilm have been issued to date. With the exception of Reel 1 which covers the 18-month period of June 1967 to December 1968, each reel includes a six-month period of publication. Reels 2 through 7 cover January 1969 to December 1971.

A Full Set

All of 1972 and the first half of 1973 will be available on microfilm in the late fall. There is currently no index, however, for any of the six-month volumes.

Cost for each reel is \$8.30. A complete set of all seven reels is available at a 10% discount, or \$52.30.

The CW microfilms may be ordered from Periodical Entry Department, University Microfilms, 300 Zeeb Road, Ann Arbor, Mich. 48106.

CHECK HERE TO ENTER YOUR SUBSCRIPTION

1 year - \$9*

*\$10 a year in Canada; all other Foreign, \$25 a year.

Charge My American Express Account:

--	--	--	--	--

New subscription

Change of address

PLEASE CIRCLE 1 NUMBER IN EACH CATEGORY

YOUR INDUSTRY

- 01 Mining/Construction/Oil & Refin.
- 02 Manufacturing - Computer or data system hardware/peripherals/other associated mechanical devices
- 03 Manufacturing (other)
- 04 Utilities/Comm Sys/Transport
- 05 Wholesale/Retail
- 06 Finance/Insurance/Real Estate
- 07 DP Serv. Bureaus/Software/Plann.
- 08 Business Services (except DP)
- 09 Education/Medical/Legal
- 10 Federal, State and Local Govt.
- 11 Communications/Printing/Publ.
- 12 Other:

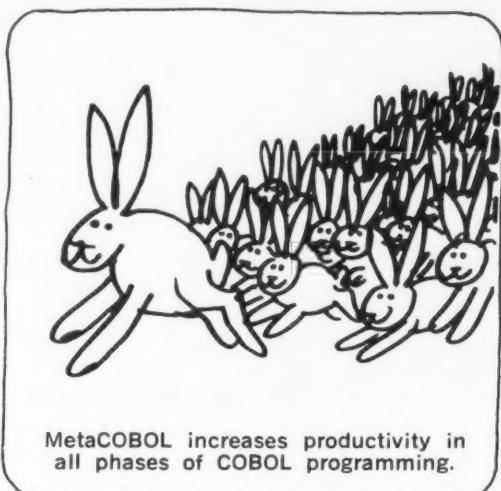
YOUR FUNCTION

- 01 Corporate Officer
- 02 Data Processing & other Operational Mgmt
- 03 Data Processing Professional Staff
- 04 Consultant
- 05 Lawyer/Accountant
- 06 Engineering-Management/Scientific/R&D
- 07 Sales/Marketing/Account Exec.
- 08 Librarian/Educator/Student
- 09 Other:

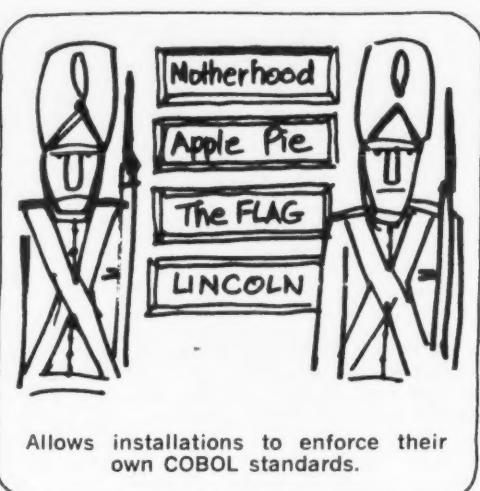
Did You Know?

One of a series MAKING IBM INSTALLATIONS WORK BETTER

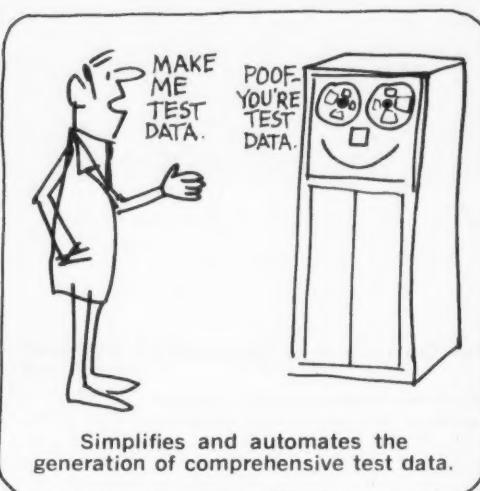
ADR's MetaCOBOL System could double your COBOL productivity.



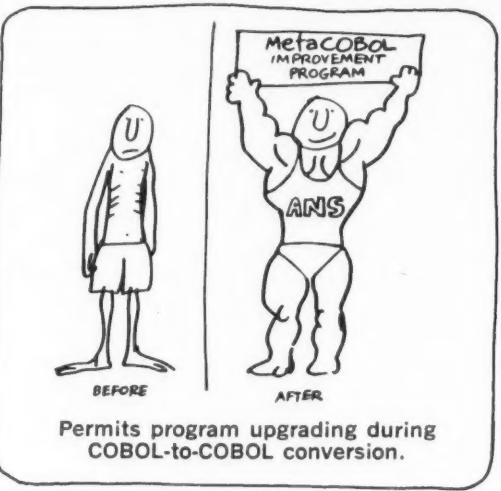
MetaCOBOL increases productivity in all phases of COBOL programming.



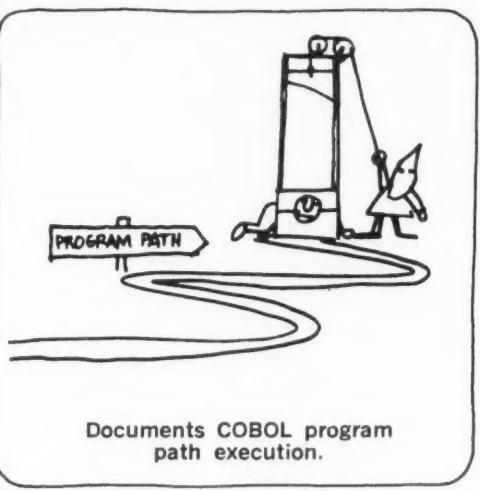
Allows installations to enforce their own COBOL standards.



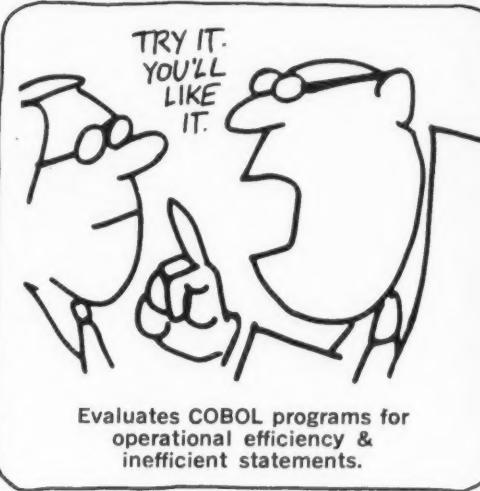
Simplifies and automates the generation of comprehensive test data.



Permits program upgrading during COBOL-to-COBOL conversion.



Documents COBOL program path execution.

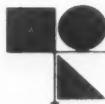


Evaluates COBOL programs for operational efficiency & inefficient statements.

ADR's MetaCOBOL not only increases productivity. It helps you manage your installation significantly better. MetaCOBOL is an ADR breakthrough in COBOL development, testing, debugging, maintenance, evaluation, measurement, conversion and standards control.

Shouldn't your COBOL installation gain these benefits, too? They're proven in use at over 100 companies. MetaCOBOL is 100% compatible with COBOL.

For further information, just send us the attached coupon, or contact any ADR office.



APPLIED DATA RESEARCH THE SOFTWARE BUILDERS®

ADR software products: in use at over 2,500 installations worldwide.

U.S. offices in Atlanta, Boston, Chicago, Cleveland, Detroit, Houston, Los Angeles, New York, Pittsburgh, Princeton, St. Louis, Washington, D.C. Representatives in Australia, Austria, Belgium, Brazil, Canada, Denmark, England, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Puerto Rico, South Africa, Spain, Sweden, Switzerland, Taiwan, West Germany.

APPLIED DATA RESEARCH, INC.

SOFTWARE PRODUCTS DIVISION

Route 206 Center, Princeton, New Jersey 08540

Telephone: (609) 921-8550

Yes, I'm interested in MetaCOBOL.

Name _____

Company _____ Title _____

Address _____

City _____ State _____ Zip _____

Telephone _____

Computer Configuration

I am also interested in:

- The LIBRARIAN ... for security and protection
- AUTOFLOW ... for maintenance and debugging
- SAM ... for planning
- ROSCOE ... for on-line program development
- PI SORT ... for faster sorting

Without Revealing Personal Data

Mass. to Get U.S. Drug Funds

By Marguerite Zientara
Of the CW Staff

BOSTON — The State of Massachusetts is still refusing to supply personal information to various Federal Government drug data banks, but without the threat of losing Federal funds.

In response to letters from Gov. Francis W. Sargent and Boston Mayor Kevin H. White stating they would do without Federal funds rather than supply Client Oriented Data Acquisition Process (Codap) forms [CW, Aug. 15], Peter Bourne, acting director of the Special Action Office for Drug Abuse Programs (Saodap), informed Marge Elzroth of the state's Human Services Department that Massachusetts would be exempted from participation in personal identification aspects of the Codap system.

"If Massachusetts will take the responsibility for providing aggregate data, that will be alright with us," Bourne told Elzroth.

Bourne said Massachusetts could elect to keep personal identification data at individual drug treatment clinics or in the state's Department of Mental Health.

Massachusetts then began moving against a second drug information program. In a letter being drafted last week, Sargent will instruct state drug treatment facilities — including hospitals and crisis centers — not to forward client-identifying information to Project Dawn (Drug Abuse Warning Network), according to Andrew Klein, aide to Sargent.

Dawn is a year-old project of the Justice Department's Drug Enforcement Administration, the former Bureau of Narcotics and Dangerous Drugs, aimed at acquiring information about existing and developing patterns of drug use. Dawn is operating in Massachusetts, but officials have refused to identify local participants.

Unlike Codap, Dawn involves no Federal funds and, according to Ernest A. Carabillo Jr., acting chief of the Drug Enforcement Administration's special programs division, participating hospitals and crisis centers are not required to forward identifying information if they object.

Carabillo said the program's reporting forms were changed earlier this year to include spaces for such information as Codap requires — subject's birth date, race, sex, the first two letters of the subject's mother's given name and the first two letters of the subject's mother's surname — at the request of Saodap, developer of Codap.

After the Federal Government informed Massachusetts of its decision about Codap, Klein said, "We decided we had to get word to the hospitals letting them know we thought the client identification section of Dawn was a bad, ill-advised program for them to participate in."

Journal Details Line Discipline

By Ronald A. Frank
Of the CW Staff

WHITE PLAINS, N.Y. — When asked for details about the SDLC data transmission line discipline, an IBM spokesman said, "specific detailed information concerning implementation [of SDLC] will be made available when we ship to the first customer."

Despite this statement, the transmission discipline has been described in detail in at least one technical journal.

An article in the November 1972 *Proceedings* of the IEEE, called "Line Control Procedures," gives the most complete look yet at SDLC, outside of IBM. The article was written by James T. Gray, manager of the communication architecture studies department at IBM's research division in Research Triangle Park, N.C.

Before assuming its SDLC designation, the line discipline was called Advanced Data Communications Control Procedure (ADCCP) and, according to Gray, it was in the process of being "defined, standardized and introduced to data communications use." The article said ADCCP was also known as SDLC.

Transparency Needed

"ADCCP starts with the premise that a line control should be code-insensitive and transparent to the characters in the text to be transmitted," Gray said.

"To achieve this transparency, a special control character called a frame is defined to be the bit sequence "0111110," that is zero, five ones, and a trailing zero. All transmissions are then constructed so that they begin and end with frames."

The message format of SDLC will take the pattern of

F	A	C	Text	BC	F
---	---	---	------	----	---

Where F is a frame as previously defined; A is an eight-bit address field; C is an eight-bit control field; Text is an information field of arbitrary length re-

stricted only by the buffering constraints of the terminal stations involved and by the error characteristics of the channel; BC is a 16-bit block check field using the CCITT Cyclic Redundancy Check polynomial; and F is the terminal frame which may also be the lead frame of the next message block.

Transparency is achieved during transmission by scanning the "AC Text BC bits, five ones in a row and inserting a zero." This preserves the uniqueness of the frame on the line, the article said.

Since frames are unique, at the receiving station "AC Text BC" can be isolated and one zero deleted after every string of five ones. "AC and BC" are then positionally identified as the first 16 and last 16 bits of the resulting string and Text is everything else transmitted.

"Code sensitivity of asynchronous modems remains a problem," Gray said. To eliminate this, non-return to zero encoding of the data stream is employed."

Three message formats are defined, the article continued. The first format, described above, provides for normal half- or full-duplex message transfer between a primary and a single secondary station by defining a transmit sequence number and a receive sequence number, each of three bits, and a response bit for the primary station, which is also a final bit for the secondary station.

The second message format is: "Frame AC BC Frame," and is used by the primary station to acknowledge secondary transmissions or to request additional transmission, or to request retransmission, and to inhibit the secondary station from transmitting.

The third format is used for non-sequence transmissions and contains no sequence number. It may or may not contain a text field.

The article concludes that ADCCP fits a variety of operations including half-duplex; full-

duplex; full conversational operation; hub poll operation; and operation in point-to-point, multipoint and loop facilities.

The architectural advantages of the code, according to Gray, are:

- Code independence.
- Full transparency.
- Unique synchronization.
- Full checking of data and commands.
- High efficiency in full duplex mode on channels with long propagation delays.
- No long-term mode switching.
- Capability to accept later controls and responses.

The exact similarity between the transmission discipline described by Gray and the SDLC version announced by IBM will not be known until IBM announces further details. It is believed the hub polling capability referenced by Gray will not be supported by IBM. And other discrepancies are possible.

IBM also said details of its DLC line discipline will not be released until the first remote 3704/3705s are delivered in February 1974. It is possible the relationship between DLC and SDLC will become more clear at that time.

IBM's SDLC Should Aid Data Users

(Continued from Page 1)
users with extensive remote batch applications are expected to benefit.

According to IBM, there are five major advantages associated with SDLC for data users:

- The discipline is more efficient in interactive environments.
- It provides error checking for all elements within transmitted messages.
- It is transparent in that any bit pattern can appear in text.
- It uses positionally significant control.
- SDLC is bit-oriented rather than character-oriented.

Few IBM systems have yet been announced that will operate in SDLC mode. The line

Editorial

The User's Choice

(Continued from Page 1)

a greater identity as the representative of the entire computer community.

Thus, business-oriented users would have a greater voice in planning the future National Computer Conferences, the biggest single Afips activity. And DPMA could salvage its annual conference as a high-level management/technical meeting, while eliminating the small exhibition that does little for the professional or technical betterment of the attendee, and less for the financial coffers of DPMA.

DPMA could also share in the revenues of the much larger NCC.

It is possible, of course, that DPMA would elect to keep the exhibit portion of its conference, a portion which has featured mostly supplies and accessories in recent years. A few of the Afips societies still conduct their own conferences, with and without exhibits. ACM has even changed the format for its "commercial program," as now for the second consecutive year the "exhibits" consist of formalized sales pitches for software products.

While the reputation of DPMA itself would be enhanced by joining Afips, members might argue against the loss of autonomy.

The fledgling Institute for the Certification of Computer Professionals would receive a financial boost if one of its biggest proponents joined the Afips community.

But the biggest benefit of all could be in the planning of the technical programs of NCC, plus the other workshops and seminars conducted by Afips during the "off season."

And more DP users would have a voice when Afips is called to testify before Congress, when bills affecting the computer community are debated.

Acceptance seems to be in the wind, for only last week DPMA reminded the press the deadline for the committee's recommendation was just around the corner. We doubt the reminder would have been issued unless the decision at hand were a momentous one — i.e., "we accept."

Since the DPMA is near completion, and since the committee will submit a formal report only two weeks after the Aug. 31 deadline, users should take advantage of this "eleventh hour" and make their preferences — and the reasons for those preferences — known to the committee.

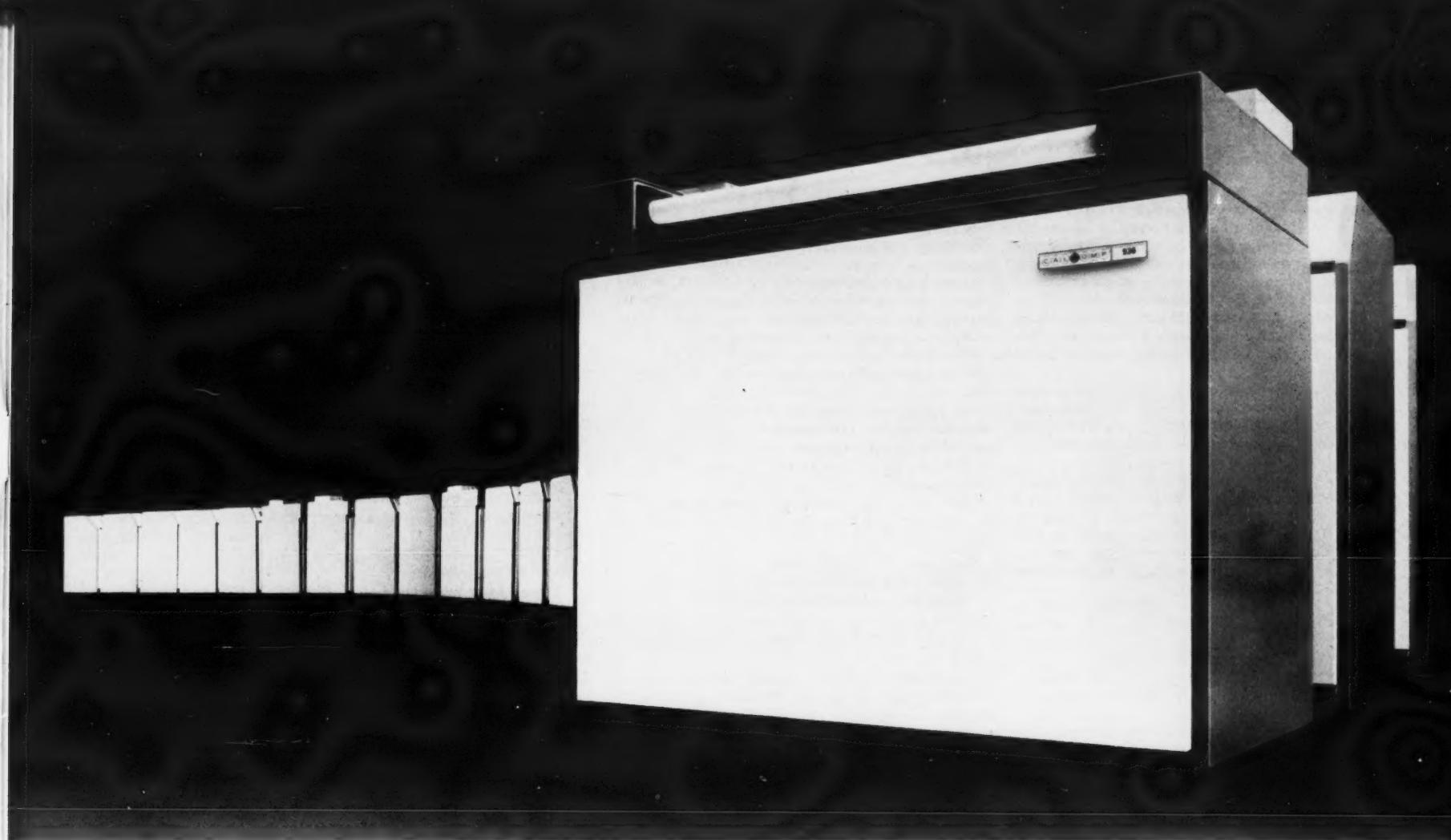
The president of DPMA is Jim Sutton, chairman of the study committee. Users interested in voicing their opinion should direct correspondence to Sutton via Executive Director Donn Sanford, DPMA International Headquarters, 505 Busse Hwy., Park Ridge, Ill. 60068.

they are believed to be similar.

The basic SDLC transmission rate for the two point-of-transaction systems is 2,400 bit/sec with an optional 4,800 bit/sec speed available, IBM said. The line discipline allows both half-duplex and full-duplex operation.

For short distances or where low capacity demand exists, users can utilize half-duplex SDLC mode while long distance transmissions would be more economical in duplex SDLC mode, IBM said.

On long distance links with multi-dropped terminals, one terminal could transmit while another terminal was receiving data over the same duplex SDLC circuit.



When you're the leader, how do you follow the leader?

We introduced digital plotting.

For the last ten years, our drum plotters have set the standards of their industry.

Our 565, and the models we've built around it, have made us the largest manufacturer of drum plotters in the world.

But we've known for a long time that someone would come along with something new one day. What we've been working on, is making certain that the new leader would still be us.

Starting now, you'll measure drum plotters by our two new models.

First, the 936. It's faster and it has greater plotting quality than the unit it replaces.

And, it costs less.

Next, our top of the line 1036. It's almost twice as fast as the 936. And again, its plotting quality is higher and its price is lower than the unit it replaces.

We've increased performance and decreased the price of the drum plotter. And that's going to be a hard act to follow.

Call or write California Computer Products, Inc., CW-M8-73, 2411 West La Palma Avenue, Anaheim, California 92801. (714) 821-2011.



CALCOMP

Files on DP Managers in 'Our Heads'

By Michael Weinstein
Of the CW Staff

Frequent allegations that vendors in general and IBM specifically keep written dossiers on individual data processing managers are untrue, according to a *Computerworld* survey of former IBM (and other vendor) salesmen.

Of the eight former IBM sales personnel now working in firms in direct competition with IBM, all stated they had neither seen nor heard of any written records.

Although records may not have been written during their employment with IBM, the salesmen and coworkers sometimes verbally spread and used information on DP professionals that could be helpful in sales efforts.

These efforts took two slants, they related, either recommending a DP professional with a history of running full and frequently upgraded IBM computer operations or trying to dissuade prospective employers from hiring a man who might change or mix systems and thus hurt sales.

One source stated in one case he was trying to sell a large multiprogramming system, but the prospective user had reservations about his firm's ability to run the larger system.

"I called other branch offices and asked if they knew of a good man who was looking for a job," he stated.

This led to finding a DP professional who was quite competent and oriented toward IBM who was brought in above the present DP manager and given the title of vice-president, manager information systems.

Another case cited was a former salesman who learned one of his biggest users was contemplating hiring a new DP manager who had previously been employed in Cincinnati.

When he called the Cincinnati office, he was told this particular individual would cause trouble.

The former salesman related how he had been able to support the present DP manager by indicating to management that he was highly competent for any expected increase in computer operations.

"This left us with a very grateful DP manager," he related, "and thus, a very safe and productive account."

Talks with former salesmen and present salesmen for other vendors indicate these practices are common to all mainframe suppliers.

But in every case, no one surveyed had any knowledge or had ever heard of any written dossiers.

"We keep it all in our heads," a Honeywell salesman said. "It is too dangerous to be on paper."

The Good and Bad of It

Give Him a Broom, It's Not His Day

NEW YORK — Wouldn't you like to know if this is one of those days you "should have stayed in bed"?

Well, Time Pattern Research Institute says it can print out a year-long chart predicting your "good" and "bad" days.

The predictions, said Bernard Gittleson, president, are based on the theory of biorhythms, the science of life's "inner clocks" which regulate day-to-day existence.

Biorhythms are based on three cycles — emotional, intellectual and physical — of varying lengths. The highs and lows of the cycles determine the status of each day for each characteristic.

George Thommen, leading investigator of this science, has worked closely with the institute, to assist in programming a 360/40 to print out the annual reports. Each individual, depending on his day and year of birth, has a different biorhythm.

A number of Japanese companies, including Hitachi, have requested reports for their employees, Gittleson said. "That way, the foreman can assign a worker to low-risk jobs on the six to eight critical days each month."

It Was Fun Working Anyway, Wasn't It?

NASHVILLE, Tenn. — Remember the good old days when it took a week to 10 days to get a Social Security card? Now that the Social Security Administration has begun using a central computer system in Baltimore to issue the cards, it can take up to nine weeks.

"Not all the bugs are worked out yet," said Tom Read, Social Security district manager, "and the computer simply has not caught up with the backlog."

The problem now is that many teenagers working for the first time this summer cannot collect their paychecks simply because they haven't received their cards yet. They say they may be back in school before they get their first check.

'Hmm, Hom Asked, 'I or 2 Tickets for \$2,186'?

SAN BRUNO, Calif. — This family fight cost Warren Wing Hom more than a black eye.

Investigating a family squabble, San Bruno Police arrested Warren Hom for disturbing the peace.

A routine computer check with the Police Intelligence Network (PIN) revealed the unemployed recreation director had a long list of traffic warrants after his name, most with fines set at \$10 or \$21.

When confronted with the list of violations, Hom said, "I was a little worried. I knew I had one or two."

Those "one or two," plus all the others, amount to \$2,186.

City to Get DP Library on Drug Abuse

By Marguerite Zientara
Of the CW Staff

PHOENIX — A computerized library hooked up to Washington, D.C. — meant mainly for use by drug abuse and alcoholism professionals — will be installed in the Phoenix Public Library in September, despite local protests that the library should perhaps be located at a medical center where professionals main-

tain medical libraries, instead of in "an ugly stall" which would detract from the library's appearance.

Opponents claim the Phoenix library has been overloaded for years and it will take at least two years before a planned addition is built.

The Drug Abuse Communications Network (Dracon) has access to about 13,000 abstracts

from drug literature, stored in a computer at the National Institute of Mental Health's National Clearing House for Drug Abuse Information in Rockville, Md.

Besides printouts, the communications setup can be used for requesting free educational materials from Washington, including films, pamphlets, books, and educational program units.

Computer Leasing Seminars

A series of computer financial leasing seminars will be presented jointly by Telex Computer Products, Inc. and Capital Marketing Corporation during September and October. Also in attendance at the seminars will be representatives from one of the largest financial institutes in the country. The seminars will cover financial and operating leases associated with IBM System 370 CPU's, Telex peripherals, and other aspects of profitability associated with leasing for the user.

Two sessions will be held in each of the following cities on the dates indicated:

San Francisco	Sept. 11	Detroit	Sept. 26
Los Angeles	Sept. 13	Cleveland	Sept. 27
Dallas	Sept. 18	New York	Oct. 2
Atlanta	Sept. 20	Boston	Oct. 3
Chicago	Sept. 25	Philadelphia	Oct. 4

Complete information on the seminars, their meeting times and locations is available from these Telex Area Managers:

WALTHAM, MASS. — Al Lucchese
460 Totten Pond Road (02154)
(617) 890-4910

NEW YORK — Frank Jerd
6 East 43rd Street (10017)
(212) 867-9780

ROCKVILLE, MD. — John Kerr
6110 Executive Blvd. #222 (20852)
(301) 881-7610

MIAMI — Bob McLeod
7600 Red Road, Suite 305 (33143)
(305) 661-7641

CHICAGO — Jerry Johnson
111 East Wacker Drive (60601)
(312) 644-5100

SOUTHFIELD, MICH. — Bill Bones
21415 Civic Center Drive (48076)
(313) 358-1195

SAN FRANCISCO — Bob Hicks
Fibre Board Building,
55 Francisco St. (94133)
(415) 398-4888

ENCINO, CALIF. — Ron Bromwell
16255 Ventura Blvd.,
Suite 401 (91316)
(213) 986-9252

DALLAS — John Joyce
11311 North Central Expressway,
Suite 206 (75231)
(214) 691-6861

MAKE YOUR RESERVATION NOW.

where the difference begins

TELEX

Preferred
the PERIPHERAL COMPANY
TELEX COMPUTER PRODUCTS, INC.
6422 East 41st Street • Tulsa, Oklahoma 74135 • 918 627-1111
TELEX, LTD.
TELEX EUROPEAN GROUP
101 Duncan Mill • Don Mills, Ontario, Canada • (416) 445-8050
213 Oxford Street • London W1R-1AH, England • 01 734-9131
Paris • Frankfurt • Zurich

Reporting Plan to Aid Safety

Ontario Roads Closely Watched

TORONTO — The Ministry of Transportation and Communications uses a computer to monitor what are some of the world's most closely watched roads.

Since 1945, the Province of Ontario has built an accident reporting system that intends to give an accurate picture of the accident rate and traffic volume for every 500 feet of the 13,000 miles of highway in the province.

In early 1968, accident reports that had been processed by the former Department of Highways were fed into a computer. However, since the old collision report form was not designed for use by the computer, the Ontario Provincial Police, local police and the Department of Transport had to codify all the data, according to Paul de Valence, computer services project engineer.

One year ago, all police forces in On-

Two Out of Five's Not Bad

MILWAUKEE — A "7" may look a lot like a "1", but "0" doesn't look anything like \$80,990.

As the result of an input error, Crawford County's computer number, 12, was assigned to Wood County, whose number is 72.

This resulted in a cut in the Crawford County revenue-sharing payment, a cut which was intended for Wood County. The cut reduced Crawford's revenue-sharing check to zero, though it should have been \$80,990.

Even though the error was discovered by the Office of Federal Revenue Sharing before the checks went out, no one changed the computer input. As a result, the county and 17 of the local governments within the county received underpayments.

Much to the relief of Crawford county, the correct amount will be paid, officials said.

tario began to use a new collision report form. "This form has taken us one step closer to complete automation," de Valence said, "which will no doubt come within five years and is a tremendous achievement when you consider we have to process approximately 150,000 collision reports annually."

Out of all the data comes a book called *Traffic Volumes and Collision Rates*. "We watch the collision rates rather closely and if a particular stretch of road starts to record a collision rate higher than the provincial average, we identify it as a problem and try to find out what's wrong," said Tom Mahony, one of the originators of the program.

Hurricane Hunters Have Heavy Helper

WASHINGTON, D.C. — "Huricomputer." That's what you get when you cross a hurricane with a minicomputer. And that's what the U.S. Air Force's Hurricane Hunters are doing, to quickly and accurately predict a hurricane's strength and the path it will take.

A minicomputer is part of the Lo-Cate System, designed by Beukers Laboratories of Bohemia, N.Y., that gives meteorologists the exact speed and direction of hurricane winds. Previously used satellite photographs showed only the storm's general movement.

The system uses Beukers' newly developed technique of signal retransmission to measure the wind in a hurricane by tracking an instrumentation package dropped into the storm from a plane.

The Data General Corp. Nova 1200, mounted in a plane, locates the package and then calculates the direction and speed of wind.

There's No Lack of Data on Poor at Health Center

By E. Earl Richards

Special to Computerworld

ATLANTA, Ga. — They come each day, as individuals and as whole families, the young, the middle-aged, and the old, bringing with them all manner of social problems and all kinds of health needs. But mostly they come to the Atlanta Southside Comprehensive Health Center (ASCHC) with hope, for they are the urban poor, with incomes so low and with ailments so numerous that for the vast majority of them, it is the first time in their lives that they are able to receive continuous and quality health care.

At the very heart of the center is an information system committed to the belief that the residents in the target area are entitled to quality care, and there is no question that efficiency in information handling enhances the quality of the care given at the center.

Over 200 Programs

The ASCHC has an IBM 360/22 card, disk and magnetic tape system and a staff



Dr. E. Earl Richards

of 12 in the data processing department. Under the supervision of data processing director John B. Aycock, more than 200 programs have been written to support about two dozen different information systems.

Besides such standard bread and butter accounting applications as payroll, budget

control, accounts payable, and purchasing and inventory control, this data processing system:

- Keeps and updates master records on 26,000 persons.
- Calculates the number and type of patient visits.
- Produces patient pharmacy profiles so that a physician can quickly scan the amount and type of drugs administered.
- Prepares special reports to assist the staff in evaluating utilization — to determine, for instance, when the demand on the center is greatest so that hours of service may be adjusted.
- Scores child behavior tests to help pinpoint the cause of a child's maladjustments.
- Controls an immunization history recall system that will, for instance, keep track of when a child is supposed to come in for an immunization and print out a notification to the parents.
- Totals and classifies all third-party billing, primarily for Medicaid and Medi-

care payments.

- Prints monthly and quarterly statistical statements.

In addition, the center expects, eventually, to add on-line visual display terminals to the system to make some type of patient profile instantly available, and to have better control over appointment scheduling and patient transportation arrangements to the center.

At the center, a patient may be treated



John B. Aycock, ASCHC's data processing director (in striped shirt), explains a point on a printout to Richards and Dr. Charles H. Hamilton, medical consultant and director of Team D.

for any condition that does not require hospitalization. On the first day he comes in, his registration information is punched into cards and the cards processed on the computer. Then into the patient's medical record goes a red plastic card embossed with the patient's name and address, date of birth and patient number.

Whenever a patient is seen by a physician, a team member fills in an encounter form and using the red card this form is imprinted with the patient's name and then sent to the data processing department.

The computer is useful not because it can plot a patient's respiratory data or "watch" his blood pressure, heart rate, or chest tube drainage — as numerous computers are doing at hospitals throughout the country — but because it can act as a tool to help evaluate the center's impact on the health of the community, as well as, potentially, giving vital data on the impact of disease upon the community.

E.E. Richards is project director, Atlanta Southside Comprehensive Health Center.

You no longer have to wait in line for a data terminal,



now you can afford two new ADM-1's.

Two ADM-1 Terminals for the same investment you've been making for a single terminal. State-of-the-art design brings the ADM-1 into the \$1000 to \$1600 range.* And with even more capabilities: 960 or 1920 characters on a full-size 12" screen, complete 53 key TTY board, total cursor control, full editing capability with options, RS 232 point-to-point interface at Baud rates from 110 to 9600, underlined control characters, dual intensity protect mode, character repeat—all housed in a compact, 45 lb. answer to your budget, operations, and standing-in-line problems. Call or write for the ADM-1 brochure.

*OEM pricing available

LEAR SIEGLER, INC.


ELECTRONIC INSTRUMENTATION DIVISION
714 N. Brookhurst St., Anaheim, Calif. 92803, (714) 774-1010



To: Lear Siegler Data Products
714 N. Brookhurst St.
Anaheim, Calif. 92803

I don't want to wait in line. Send me a new ADM-1 brochure.

Name	Phone	Zip
Address	City	State

Readers Indicate Bait and Wait Occurring

LOW-PRICED
acoustic
coupler

MODEL 150 . . . NO FRILLS

- For use with all Series 33 TELETYPE Terminals.
- Half/full duplex switch.
- Carrier indicator.

\$147

COMDATA
7544 West Oakton Street
Niles, Illinois 60648
Phone: 312/692-6107

(Continued from Page 9)

We are unhappy with the final results because of the long delays, but we like the equipment. Our eyes are wide open for the next time. — Name Withheld

Poor Implementation

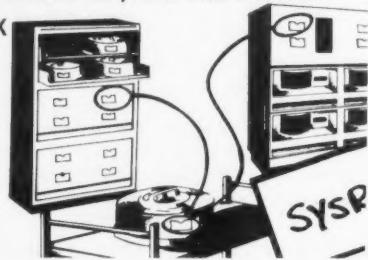
IBM was scheduled to implement an accounts payable system May 1, 1973 on a System 3/6. One week before the deadline the IBM marketing representative informed us that because of an increased field size the system would not be implemented on time. The following week IBM's programmer was on vacation. Since then we have implemented two other systems, and neither was on time.

The supplier appeared to have had definite warning that the problem was coming before he told us about it, but when the problem was noticed effectively placed the blame for the problem on us.

The system is now working, but the way it was implemented was not acceptable to us. — C. Van Cott, Programmer, Unadilla, N.Y.

SLAP-TAG®'S, UTILIZING THE UNCANNY "HOOK & LOOP" TAPE FASTENER SYSTEM, ARE THE ANSWER FOR EXTERNAL DISK FILE LABELING.

DETAILS FROM:
HEXCOT, INC.
BOX 55588-SW
HOUSTON, TEX.
77055



Firm Refused to Deliver

My problem was that CMC bid a "5" data entry system to win the bid. They apparently refused to deliver a few weeks before scheduled delivery — and so we had to take a "7" at more money.

I believe the supplier should have been able to advise us of the problem earlier than he did. When the problem was noticed the supplier took full responsibility, but did not correct the situation.

I am not at all happy with the way the problem was dealt with, and we now are going to another vendor. — Name Withheld

RPG, Fortran Unusable

My problem was that NCR does not fully support Cobol or other languages in compiling or using the full 812 byte, 32K sector 657 disk. We spent many hours and days implementing full utilization. Now we cannot use RPG or Fortran with 812-byte blocks — although our systems use multiples of this block size.

We were trying to convert to the NCR 200 with 657 disks. The problem was recognized during programming and before implementation. It was serious — but not sufficient to halt implementation.

The supplier appeared to have had definite warning that the problem was coming before he told us about it. When the problem was brought to the surface by us the supplier took some responsibility and placed some blame on us.

The problem has still not been

solved. — J. Frederick, Director of DP, Jackson, Mich.

Time-Sharing Not Available

Our problem was that commitments made by the supplier (Honeywell) were not met. The capabilities of the system recommended by Honeywell did not come to fruition.

We were considering time-sharing and the problem developed during programming and before implementation.

The supplier should have been able to advise us of the problem earlier than he did. When the problem was noticed the supplier effectively placed the blame for the problem on us.

We cancelled the contract and refused to pay Honeywell for expenses incurred. — Name Withheld

Promised, but Not Available

Our problem centered around an attempt to go to a System/3 card system with 8K. IBM grossly oversold its capabilities, and had promised support but it evaporated. We had to spend a lot of time and money deciding what we could do without using disks and printers which were not then available.

The problem turned up during programming and before implementation. At that time, it was serious but not sufficient to halt implementation.

The supplier appeared to have had definite warning that the problem was coming before he told us about it. When the problem was noticed the supplier took some responsibility and placed some blame on us.

The problem has still not been

We were not at all happy with the final results so we cancelled one month before delivery, and went to NCR Century 100 with 16K. — Garry Mullennix, EDP Manager, Huntington, Ind.

Bill Double the Expected

Our problem was that NCR quoted \$529 per month for COM service — but then billed us \$1,100 per month. Meanwhile we bought all new readers for our clients. It would now be very costly to back off.

The problem hit us full blast after implementation when the first month's bill arrived, and it was too expensive to halt implementation.

The supplier did not advise us of the problem — we told him!! When the problem was noticed the supplier took full responsibility, but did not handle it to our satisfaction. He just said the estimate was bad.

We were not at all happy with the way we were hooked in, but we have no alternative. — D. Isacken, Executive Vice-President, Palantine, Ill.

Australia's Hairy Problem

SYDNEY, Australia — Radical changes in wool marketing and handling are being advocated by a board member of the Australian Wool Corp., F.M. MacDiarmid.

MacDiarmid said the wool industry could cut costs if it eliminated many handling processes and wool was sold on a worldwide basis by computer.

He said the Wool Corp. could sell a sample wool clip by computer description.

Who can sell computers in Japan?

Shukan.

In Japanese it's called *Shukan Computer*, and in English, it means "Computer Weekly." Whatever you call it, *Computerworld's* new sister publication is an excellent vehicle for selling EDP products and services in the large and expanding Japanese EDP market. Here are some of the reasons why:

• **Shukan Computer** is a joint venture of *Computerworld* and Dempa Publications, the leading Japanese publisher of electronics information services. With the combined resources of the two companies, *Shukan* has the largest news gathering organization of its kind in the world.

• **Shukan Computer** is the only newsweekly for the fast-growing Japanese computer community.

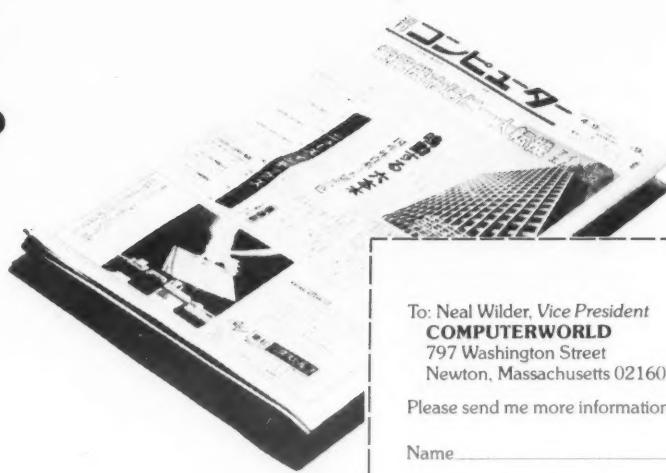
• Initial circulation is guaranteed at 35,000, divided about 80% to end-users and 20% to the computer industry. Circulation development methods currently under way are the same as those which gave *Computerworld* the highest paid circulation in its field in less than four years.

• **Shukan** lets you in on the action in the world's fastest growing EDP market. The Japanese Ministry of International Trade and Industry (MITI) has made the following 1976 forecast: 39,000 general-purpose systems installed, up from 11,237 in 1971; 11,000 minicomputers installed, up from 1,670 in 1971; and 3,000 industrial systems installed, up from 1,086 in 1971.

• Is this growth likely? The latest census of general-purpose systems revealed that there were 14,806 systems installed as of September 1972, a one-year gain of 3,569 units and \$911 million installed value, a growth of 31.7% and 23.1% respectively. And more than 50% of these new systems were American made.

• It is true that there are import restrictions. But Japanese vendors and users can get permission to import almost anything they want and need. As a result, 1972 imports were over \$360 million.

• Advertising in *Shukan* is easy. With *Computerworld* representatives across the U.S. to assist you, it's easy to place space in *Shukan*. For a small fee, we can translate and type-set your ad from English to Japanese. To get more facts, just send in the coupon.



To: Neal Wilder, Vice President
COMPUTERWORLD

797 Washington Street
Newton, Massachusetts 02160

Please send me more information on *Shukan Computer* advertising.

Name _____

Title _____

Company _____

Address _____

Zip _____



COMPUTERWORLD

SOFTWARE & SERVICES

Congratulations

Packages Cited In Honor Roll

MOORESTOWN, N.J. — Seventeen proprietary software packages have been elected to the 1973 Datapro Software Honor Roll on the basis of their outstanding performance as judged by their users.

Each of the packages, including two from IBM, was rated excellent in the key category of overall user satisfaction by respondents to Datapro Research Corp.'s first survey of user/subscribers.

The list shows nothing but systems support/utility packages, one observer noted, probably indicating a continuing mistrust of application logic that was "not invented here."

Each of the honored packages was used by enough users, a Datapro source noted, to make the evaluation meaningful. Several other packages also received excellent ratings but from too few users to justify a place on the honor roll.

The honor roll packages and their suppliers include: Alltax (Management Information Service); Amigos (Comress, Inc.); Dump/Restore/Copy (Westinghouse Tele-Computer Systems Corp.); DUO 360/370 (renamed UCC TWO); University Computing Co.; DYL-250 (Dylakor Computer Systems, Inc.); Easyltrieve (Ribek Corp., marketed by Pansophic Systems, Inc.); Epat (Software Design, Inc.); Grasp (Software Design, Inc.); The Librarian (Applied Data Research, Inc.); Panvalet (Pansophic Systems, Inc.); Power (IBM Corp.); Quikjob (System Support Software, Inc.); RPG II (IBM Corp.); Score (Programming Methods, Inc.); Spooler (Booth Computer Corp.); Syncsort (Whitlow Computer Systems) and Total (Cincom Systems, Inc.).

To compile this list, Datapro 70 asked its 5,000 subscribers to summarize their experiences with software packages, with the request that they be specific by package in their comments. Responses were received from 191 users, Datapro said, and they reported on 174 packages.

Forty of these were rated by three or more users and of these, the 17 that earned an average rating of excellent based on several questions, were named to the honor roll.

The complete results of the software user survey are contained in a special report, *User Ratings of Proprietary Software*, which is available for \$10.

Datapro Research Corp. is at One Corporate Center, Route 38, 08057.

Correction

The GTE Accounts Payable/Financial Management System [CW, Aug. 15] is available under license agreement for a one-time charge of \$14,400.

'Super Check' Basic EFT

Package Cuts Bill Paying Paperwork

By Don Leavitt
Of the CW Staff

NAPERVILLE, Ill. — Commercial banks can simplify the work of their operations departments, their checking account customers and merchants with whom they do business, with the addition of Super Check software from Bob White Computing and Software.

Super Check, linked to a bank's demand deposit (checking) accounting application, comes close to being a complete electronic funds transfer (EFT) system, a spokesman admitted.

Easing the Flood

The operations people have an easier time because Super Check eliminates much of the flood of individual checks that still must be processed by the banks and clearinghouses.

Less paperwork is needed because the checking account customer writes only one Super Check with multiple payees, during whatever pay period he arranges with the bank. The Super Check is in fact a turnaround document generated by the bank, listing all merchants, insurance companies or other payees the customer has requested to be carried on his file.

The document shows year-to-date payments for each listed payee, and provides a space in which the customer can fill in any amount he wishes to pay the particular payee during the current cycle.

Within the bank, the customer's account is debited for the total amount of the Super Check, and the separate payments are distributed to the designated payees. If the payees are themselves customers of the bank, the payment is made directly to their accounts.

Otherwise, all payments for a merchant or other payee are accumulated during the Super Check processing cycle and a single check is generated for the payee at the end of the processing run.

In His Sequence

Whether or not the payee has an account with the bank using Super Check, the system generates a report for him of the individual payments received that cycle in his customer number sequence so that he can distribute them properly within his receivables accounting.

The Super Check user can update the list of payees carried on his file by simply adding new names to the turnaround document or striking old ones from the prepared list. He can also break down the total payment for any payee into budget category in which case he will be furnished year-to-date figures by category as well as by payee.

Less Worry About Quality

The merchant or other recipient of Super Check payments not only has less paperwork but he has less worry about the quality of the payments as well, a company spokesman said.

Super Check has been implemented on IBM 360/370 mainframes and takes a minimum of 28K bytes of storage. It is written in BAL, and Bob White sells the entire package for \$15,500, including training in the marketing approach the bank should use to sign up merchants and checking customers. The software by itself — both source and object code (and documentation) — costs \$10,000.

The vendor is at 830 Diane Lane, 60540.

'Safegard' Uses Transient Keys To Code, Decode Data Files...

TROY, N.Y. — Data files used by programs executing under any 360/370 operating system on a 360/25 or larger CPU can be made completely secure from unauthorized users through the four subroutines that make up the Safegard system from Digital Solutions.

Safegard encodes user-chosen data fields, including an entire record if required, according to an algorithm which is selected by specification of a 16-character key. The data is decoded, for use within an application program, only if the proper key is specified.

Files Invulnerable

In this way, the company noted, the files are never vulnerable to stand-alone utilities or to operational error. Further, the keys used by Safegard need not be stored on secondary storage where deliberate or inadvertent access might be possible.

For further protection, the key specified to Safegard at execution time is destroyed as soon as the encryption algorithm is selected.

On a 360/50, the actual encryption/decryption key need not be present in memory for more than 700 μ sec.

Safegard is designed to protect files whether they are accessed in local, remote, time-shared or batch operation. It functions equally well in DOS, OS, VS and Asp or TSO options.

Any numeric, alphanumeric or alphabetic information can be processed including object decks and load modules, Digital noted. Since any of the EBCDIC or ASCII characters can be used to make up the key, some 2.2×10^{38} possible encryption algorithms exist.

Additionally, each distributed copy of

the Safegard package uses a unique algorithm to generate the encryption/decryption mapping. Thus knowledge of the key used by an installation to encode a file is not enough to decrypt the information. The very same Safegard program used to encrypt the file must be used to decipher it as well.

Safegard is written in Assembler and requires about 1K of memory. It is distributed in object deck form, with documentation and examples, for a one-time price of \$250.

Digital Solutions can be reached through P.O. Box 424, 12180.

... 'Sourcegard' Saves Programs

NEW YORK — A disk-oriented source program protection program for IBM 360 users, Sourcegard from Datasonics prints the version number, program name and compilation date whenever a program under its control is executed.

In many respects Sourcegard is very similar to a number of librarian packages. It allows up to 99 versions of a program to be maintained in a disk library, and can produce an audit trail of all changes.

Validation Feature

Once a program is put under Sourcegard control, all changes to it must be made through the system. A validation feature can detect discrepancies between the source and object programs, the vendor said.

Data compression and scrambling techniques are used to save storage space and to protect the library. Beyond that, password protection is used to prevent unauthorized access to the programs.

Management intervention is required to change a password, delete a program, delete versions of a program, punch a source deck or create temporary changes in a stored program.

Sourcegard uses direct access files and no reorganization of user files is needed. Nor is it necessary to pass an entire file to access a single program. Standard JCL and I/O functions are used.

Program statements are resequenced by the system as the programmer revises his logic and, in general, the system supports a variety of clerical functions so the technician can concentrate on technical tasks.

Sourcegard itself is self-relocatable and uses device-independent work files. It is written in Assembly language and is intended for 360/22 and larger CPUs.

The system is available on perpetual lease for \$1,500, which includes maintenance for the first three years. Monthly payment plans are also available, the company said from 663 Fifth Ave., 10022.

Nobody Schedules Multiprogramming the Maximum Advantage Way... Except Our Customers

Value Computing's customers have a tool, our Scheduling System, in the hands of their schedulers that pays off big. With Value Computing, schedulers don't just schedule, they also optimize the loading and balance of the entire computer system. Benefits frequently experienced are:

- productivity increases of 20-40%
- savings of hundreds of thousands of dollars



Value Computing Inc.
496 Kings Highway North
Cherry Hill, New Jersey 08034

Scheduling Tools for
OS/MFT and VS1
OS/MVT and VS2
DOS and DOS/VS

Value Computing Inc.
496 Kings Highway North
Cherry Hill, New Jersey 08034

I'm interested in More Details:

- About Your Computer Scheduling Systems
- Have a Salesman Call
- I Don't Believe You, But I'll Listen

Name _____

Title _____

Company _____

Address _____ ZIP _____

Telephone _____

keep it quiet

- Line printers
- Terminals
- Data communications

Gates quiets any noisy machine at the source. Our attractive, easy-to-install enclosures are so effective you can use the machine where it is needed most. Write for our new brochure or call toll free (800 358-8265) today. Over 200 models available.

Gates Acoustinet, Inc.
Box 1406cw
Santa Rosa, CA 95403
Send me your new brochure.

Name _____
Address _____
City _____
State _____ Zip _____

GATES 

Compare Cost And Capability

Wyle 8000 vs. IBM 2260



A quick look at the chart below proves that Wyle's Series 8000 CRT display system has far more capability than IBM's 2260 2848

Up to 40% depending on the configuration. Plus a substantial reduction in electrical and air conditioning costs because of our solid state design

Feature	IBM 2848/2260	Wyle 8000
1920 Character CRT	No	Yes
CRT's Per Controller	8 or 16	16
Non-Destructive Cursor	Optional	Standard
Colon Seeking Tab	Optional	Standard
Line Address	Optional	Standard
Character Address	No	Standard
Character Insert	No	Standard
Character Delete	No	Standard
Erase Display	Standard	Standard
Erase End Of Line	Optional	Standard
Erase End Of Screen	Optional	Standard
Repeat Key (All Char)	No	Standard
Printer (Optional)	15 cps	100 cps
Columnar Tab	No	Optional
Lower Case Alphabet	No	Optional
Function Keys	No	Optional
Numeric Inset	Optional	Optional

And when you decide on your Wyle system, you'll begin saving money from day one.

How much?

So get the whole story of the Wyle 8000. Write for our brochure or phone the local office of 

WYLE COMPUTER PRODUCTS, INC.
A Subsidiary of Wyle Laboratories
128 Maryland St., El Segundo, CA 90245 (213) 678-4251

Software Also Vital

End Users, Managers Aid Small DP Staff

By Don Leavitt

Of the CW Staff

ERIE, Pa. — Organized involvement of end-user departments right from the beginning of DP projects that concern them, effective reporting techniques for management, and good software tools to support the programmers make it possible to run a good sized installation with a small staff, according to John J. Prehoda, manager of corporate computer systems at American Sterilizer Co. (Amsco).

The company has two 360s at its data center here, a Model 50 with 512K and a Model 40 with 256K main memory, both running under DOS. Peripherals include 14 Telex 2314-type disk drives, five Telex 2400-type tape drives, a Telex printer and some 43 Bunker-Ramo terminals, installed both locally and in remote sites.

To support this configuration, Prehoda has four programmers, seven systems analysts and a carefully chosen collection of software packages and other sup-

port tools.

To maintain good control, the company has designed many of its newer applications on data bases supported by the Total data base management system from Cincom Systems. Total, as a tool, made it possible to do a lot of things, the manager said. It is fast enough so that Amsco can do on-line updates, and comprehensive enough to allow the company to build the base it feels it needs. Right now, the system has 49 files in an on-line system, and Total manages all of the interrelationships that the application programs must be able to access.

Amsco is a long-time Total user, but it wasn't the company's first choice. Back in 1969, the DP staff had created an Isma file based system with a "homemade" teleprocessing monitor for a small terminal operation. The system had most of the company's manufacturing data on it, but it couldn't support on-line processing. In 1970 Amsco began the move to Total. But as fast as it is, Total isn't a cure-all. The individual application programming, in Cobol, still has to be well done to benefit from Total. "If we used Total poorly," Prehoda mused, "we'd very quickly process data

poorly."

Amsco's faith in Cincom products seems fairly firm, however, in view of the fact that it has just completed installation of a full on-line processing system, based on Cincom's Environ/I teleprocessing monitor.

End Users Participate

Prehoda's group doesn't do all the DP work at Amsco, nor would he want it to do so. Instead, the company has active systems groups in the various end-user departments, and they are responsible for initial development of any new proposals. To aid them in this work, Amsco uses the Pride package of planning manuals from M. Bryce & Associates, Cincinnati, Ohio.

Though not in itself software, the Pride approach allows these user groups to frame their early analysis work in a standardized form, before presenting it to a steering committee for further consideration.

While Pride keys to individual projects, the Project Control (PC/70) programs from Atlantic Software provide Amsco management with "good reports" on all projects that are underway at any one time. Amsco "always" has projects on the fire, Prehoda said, and PC/70 is important

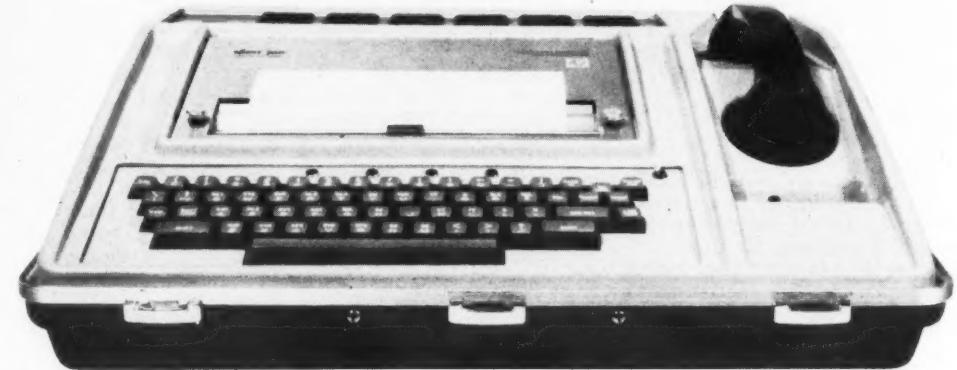
because of the number, but not necessarily the complexity, of the projects.

To aid in its own internal operations, the DP staff utilizes both the Panvalet source librarian system, from Pansophic Systems, and the Westinghouse Tape Dump/Restore package. Panvalet avoids the problem of controlling source programs in card form, and Westinghouse's utility eases the periodic capture of disk files for backup protection.

Prehoda noted that Amsco tried to have a data base administrator to control what went into the Total files "but we ran into problems. We couldn't seem to come up with anyone who knew all the data bases and all the file requirements as well as the systems analyst who designed them in the first place."

The responsibility finally has been shifted to a committee of senior people, he said, made up of project leaders, the manager of systems analysis and programming, and himself. When a user department asks for something new, the committee looks at what is already on the file and tries to determine if it would be appropriate for the apparently new need.

30 characters-per-second "Silent 700*" portable data terminal.



\$2780. Immediate delivery.



In the office or on the go, the Silent 700 Model 725 portable data terminal puts your computer as close as the nearest telephone.

The Model 725 is equipped with a built-in acoustic coupler and is packaged in an attractive carrying case.

Features include high speed half- or full-duplex operation and quiet, non-impact printing.

Field proven reliability. Records show an average of only 1.2 service calls per year on the thousands of

terminals in use.

Field service is as near as the offices listed below.

Low cost. Quantity one purchase price is only \$2780.00. Lease prices range from \$100.00 to \$145.00 per month, maintenance included.

For more information, contact your nearest TI sales office or Texas Instruments Incorporated, P. O. Box 1444, Houston, Texas 77001, or call (713) 494-5115, ext. 2124.



*Trademark of Texas Instruments Incorporated

TEXAS INSTRUMENTS
INCORPORATED

But Carriers Still 'Favored'**Montgomery Ward Benefits From Non-Carrier Modems**

By Ronald A. Frank
Of the CW Staff

WASHINGTON, D.C. — The use of non-carrier data sets can help save a company as much as \$187,000 per remote data center, according to one of the largest users with interconnection experience.

Detailed figures associated with the interconnection of non-carrier equipment were presented by Clinton D. Warkow, corporate communications manager for Montgomery Ward to a Senate Judiciary Subcommittee on Antitrust and Monopoly [CW, August 15]. The firm operates a nationwide communications network.

The company first explored the use of non-carrier equipment in late 1970 in preparation for a move into remote data processing, Warkow said. The remote installations needed a data set that operated at a speed great enough to drive a 600 line/min printer.

The firm is currently using 9,600 bit/sec

modems from a non-carrier supplier. Before this selection was made, a Bell 203 data set operating at 10.8 kbit/sec was tested, Warkow said. But "the common carrier could not get the 203 sets to transmit effectively at that time," the user said.

"Our experience to date has been that the common carrier continuously claims they do not guarantee transmission at 9,600 bit/sec," he said. But Montgomery Ward can usually transmit at this speed with non-carrier data sets if the phone line is brought up to C2 conditioning requirements, Warkow told the subcommittee.

Because Montgomery Ward retained the non-carrier 9,600 bit/sec data sets for more than two years, the supplier applied a 14% discount to the monthly rental rate, making the units available for \$137.60/mo. A later reduction brought

the data sets down to \$85/mo, Warkow said.

In describing the general benefits of dealing with non-carrier suppliers, Warkow said there "is a strong willingness by most . . . to modify their offerings to fit the demands of the user."

The data set supplier has been able to quote prices for equipment which are applicable nationwide compared with various Bell and non-Bell phone companies which can have differing rates, the user said. "This allows us to quote the same price for the same item" to all users within the corporate data network, he said. Delivery of data sets has also been coordinated on a national basis.

The resulting "national network knowledge" on the part of the non-carrier supplier has meant a greater degree of maintenance assistance, he said. He attributed this to an overall understanding of the Montgomery Ward system on the

part of the supplier.

Some disadvantages do exist for the user of customer-provided equipment, Warkow said. He pointed out that for some suppliers maintenance was "still an unproven commodity" although he said data modem firms had a better record than suppliers of voice equipment.

Current uncertainty about state tariffs regulating the non-carrier suppliers has been a problem for the company and it might have moved ahead faster if this uncertainty were removed, the user implied.

Despite the advantages of non-carrier equipment, Warkow said the common carriers provide some "very necessary services." The carriers still maintain a "favored" vendor position with Montgomery Ward due to good service over a long period of time. But the agreements with local carriers are "thirty day lease arrangements" while commitments for computer equipment are usually made for longer periods, he said. The pressure remains on the common carrier to control his rates charged to users, he added.

The savings of \$187,000 at each data center was based on the non-carrier data sets together with the removal of a medium size CPU. The processor was replaced by a minicomputer and a printer which gave the firm remote data processing ability, he said. The total savings at six data centers was \$1,026,600/yr, Warkow said.

In comparing current prices of other carrier and non-carrier data sets, the user said 7,200 bit/sec modems are available at \$145/mo "plus maintenance" from non-carrier suppliers compared to \$200/mo with maintenance from the phone company.

At 4,800 bit/sec the rates were \$160/mo "a year and a half" before common carrier equivalents were introduced in 1970 at \$200/mo, Warkow told the senators.

Novation Has PC Card Modem

TARZANA, Calif. — Novation has introduced a single PC card modem with Bell 103 compatibility.

The A-103 will operate at up to 330 bit/sec, and can be connected to a Bell CBS DAA.

The Model A-103 PC card modem costs \$200 in OEM quantities. Delivery is 45 days from 18664 Oxnard St., 91356.

"I got it from Edutronics"



"EDUTRONICS gave us the ability to integrate films into existing courses, create new curriculums . . . and provide low-cost/high-quality education."

Barbara A. Jones
Assistant Vice President
BANKERS TRUST COMPANY

BANKERS TRUST COMPANY, New York City, trains more than 200 data processing personnel annually. Because of widely differing topics and skill levels, effective individual education presented some tough problems. Bankers Trust also needed a system that let people learn at their own speed and convenience. But one that taught.

They looked into the EDUTRONICS TOTAL SYSTEMS APPROACH . . . more than 300 lessons with messages people don't forget. They're grouped into modular courses of

color films, video tapes, workbooks and study guides. They cover everything from fundamental computer concepts to sophisticated techniques and applications such as our new Virtual Storage course for advanced programmers. The result is something for everyone, regardless of specialization, corporate position, or economic justification.

Just call one of our nearby offices to find out more about the TOTAL SYSTEMS APPROACH. You can only get it from EDUTRONICS.

Edutronics systems international, inc.

Lakeside Office Park, Wakefield, Mass. 01880
(617) 246-0914

Boston (617) 245-6980
Chicago (312) 787-1722

Dallas (214) 233-9166
Kansas City (816) 756-0400

Los Angeles (213) 380-7811
New York (212) 421-4610

San Francisco (415) 989-0417
Toronto (416) 484-1992

Washington, D.C. (202) 223-2614
Winnipeg (204) 786-1434

also in London and Paris

A Subsidiary of Coleman  American Companies, Inc.

IBM 370's

are leased to save money.

CSA leases provide long term economy, while customers enjoy the flexibility of upgrading and early termination.

For further information, please call (617) 482-4671

**Computer Systems
of America, Inc.**

a computer equipment leasing company

79 Milk Street, Boston, Mass. 02109

Send for the 12 questions you should ask of any leasing company before you lease.

Name _____

Title _____

Company _____

Address _____

City _____

State _____ Zip _____

370 on order installed

Model _____ Due Date _____

SYSTEMS & PERIPHERALS

Bits & Pieces

IBM 5440-Compatible Disks Offered at Reduced Price

SANTA CLARA, Calif. — In an "introductory offer," Memorex is selling an IBM-compatible disk cartridge for 5440-type drives at \$110 each.

This compares with the standard IBM price of \$175 for the System/3 disk.

The Memorex Mark III T is available from the firm at San Tomas and Central Expressway, 95052.

Do Your Own Testing

LOS GATOS, Calif. — For \$59, users can obtain a miniature hardware testing instrument that can be used for servicing and trouble shooting systems without the need for an oscilloscope, according to the developer, Digi-Tronix.

The Model HS 50A Logic Probe can be used to indicate logic "1" and logic "0"; show symmetry/non-symmetry of pulse patterns; indicate presence of pulse trains to 25 mHz and detect and identify polarity of pulses to 20 nsec.

The firm is located at P.O. Box 1699-G, 95030.

Mini Meets IBM 3740

SANTA ANA, Calif. — Users can marry a minicomputer to IBM's 3740 Data Entry System with a floppy disk storage system from Standard Logic Systems, Inc.

The random access subsystem can incorporate up to four IBM media compatible drives. There are 77 track/drive and track-to-track access time of 10 msec. Each track holds 41K bits for a total of 3.1M bits of storage per drive.

Transfer rate is 250 kbit/sec and an 83 msec average latency time.

Price for a single drive system is \$3,950 from the firm at 2215 South Standard Ave., 92707.

S/3 Memory at 30% Off

ANAHEIM, Calif. — System/3 users can obtain a semiconductor add-on memory (up to 64K bytes) at savings up to 30% over similar memories from IBM, according to CFI Memories, Inc.

The CFI memory is fully IBM-compatible and comes in increments of 8K bytes so it can be used either as a replacement or expansion memory above the basic 8K bytes, the firm noted.

Operating specifications between the CFI memory and standard IBM memory are said to be identical. The firm is at 305 Crescent Way, 92801.

Recorder Price Reduced

LANSDALE, Pa. — The ICE Pulse Transient Recorder, Model PTR 9200, formerly priced at \$9,850 each is now priced at \$9,300 from Inter-Computer Electronics Inc., P.O. Box 507, 19446.

Keep Noise Down

Printers Speed Motor Vehicles System

By Michael Weinstein
Of the CW Staff

SACRAMENTO, Calif. — Slow printing devices in an on-line inquiry system at the California Department of Motor Vehicles (DMV) recently threatened to grind the entire system to a halt, according to Margery Lucy, acting chief of the division of EDP service.

Presently, the DMV maintains records for 12.6 million drivers and 15 million vehicles. Both figures have been increasing at a rate of approximately 300,000

per year. The mass of information had reached the point where just getting information in and out of the department's computers was a major problem, Lucy said.

This central system includes one RCA Spectra 70 Model 45 processor, one RCA 6 system and two Spectra 70 Model 55 computers. These machines handle all data communications, batch work, real-time inquiry and update processing for DMV files.

To and from this central complex come

requests from the many local state offices for information on a specified driver or vehicle.

A typical request, Lucy related, might be an inquiry from the Los Angeles office for an individual's driving record. The communications processor would receive the inquiry and transmit it to the proper data base computer for further processing. When the requested record had been assembled, it would be returned to the communications computer for transmission back to the requesting office where a hard-copy printing device displayed the output.

The main problem was with the hard-copy printing units at the requesting offices, Lucy said. They were too slow and too noisy, she added.

From the operational standpoint, this meant a multimillion dollar computer system was always slowing down to wait for the printers. From the human side, in addition to the frustration of waiting, the constant noise of banging print hammers was creating a fatigue problem. Employees were not able to concentrate on the tasks to which they had been assigned, she said.

Following a study to determine viable options, a Request for Proposal (RFP) was sent to 38 manufacturers. It specified two basic objectives: speed and quietness. Other specifications included a minimum print line of 72 characters, 30 char./sec operating speed, operator accessibility to paper at the front of the machine, visual access to the last line printed, horizontal spacing of 10 char./in., and vertical spacing of 6 line/in.

The proposal was limited to currently available commercially advertised equipment only; specially designed equipment was not allowed. Finally, Lucy said, the investigation covered non-impact as well as impact printers.

GE received the contract award to supply the DMV with 16 Terminet 300 teleprinters. These devices replaced 26 older printers. Further, Lucy noted, production from each printing station increased by almost 80%.

According to Frank Dias, supervisor, central inquiry unit, his group uses its eight terminals constantly from 8 a.m. to 1 a.m. the following morning with almost no interruption.

With these eight Terminet devices and two older units, central inquiry processes 15,000 items a day or about 3 million a year, he noted.

Each printing unit produces about 900 records per shift with each record containing approximately 9 lines of print spaced over five inches of paper, Dias commented.

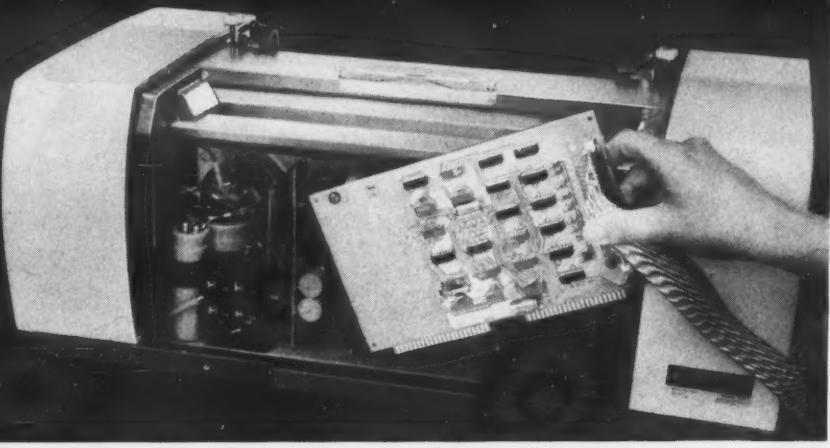
Finally a side benefit has been a noise reduction with improvement marked enough to remove glass partitions originally installed for noise abatement, Lucy said.

uniscope 100: now interfaced with all centronics printers!

- As many as 8 printers can be daisy chained—up to 200 feet from the CRT.
- 100 to 330 characters per second.
- 60 to 200 lines per minute.
- 80 or 132 columns.
- Purchase or lease.
- Nationwide service.

CENTRONICS

centronics data computer corp.
one wall street, hudson, n.h. 03051
telephone (603) 883-0111
central region: (513) 294-0070 (ohio)
chicago district: (312) 426-5533
western region: (714) 979-6650 (calif)



Study Builds Personality Profile of System/3 User

By Dave Ferguson

Special to Computerworld

Who is the System/3 user... really?

We can't exactly say that tomes have been written on the make-up of a typical System/3 installation, but we do know that it has been the subject of an incredible amount of conjecture.

About four months ago, we received a communication from a graduate student in the College of Business Administration of Pennsylvania State University who was in the process of preparing a thesis on "Minicomputers: State-of-the-Art and a Study of Software Satisfac-

tion."

Group/3 made its System/3 site lists and other facilities available to him for this study. And the results in the area of the typical System/3 site are rather interesting.

As far as the size of company using the System/3, the figures show that the average size company is somewhat larger than had previously been thought. Forty-four percent are below \$5 million in annual sales and 60% below \$10 million.

The average, however, even when two respondents with annual sales of \$1.5 billion and \$328 million were discarded,

was \$12 million. Discarding a couple of \$100 million companies would bring that figure down below \$10 million.

In terms of years of computer experience by the company,

Ferguson On System/3

60% had less than three years although the average was pulled up to 3.5 years by a few old timers who had been in the business over ten years. This is further borne out by the fact that, in 60% of the sites, the System/3

was the company's first computer and in 91% of the sites it was either their first or second.

Peripheral and software manufacturers seem to have had a tough time believing that the market was composed of such a high percentage of first-time computer users. Even though the sample size of the survey was fairly small (500) and the number of respondents naturally smaller (101), the universe is large enough to insure a fairly good statistical sample.

In terms of the number of computers within an installation, 92% of the respondents answered with a resounding "one!"

And the average is only 1.1. The small size of the sample might have a negative affect in this area, however, because there may be a significant chance that the survey missed most or all of the companies which maintain multiple sites. Bergen-Brunswick, Squib, Pfizer, U.S. Home, Caltex and Owens Illinois have over a 100 System/3s among them.

The figures do tell us, however, that this is far and away a one-computer-per-installation market.

How Many Programmers

The number of programmers employed within an installation is also interesting. Sixty-five percent of the sites had less than two programmers and 93% less than three. The average is 1.4.

However, there seems to be a dichotomy here when one looks at the part of the study dealing with software. The figures show that 60.2% of installation programs were written *in-house*! Those 1.4 programmers are either wizards or work 24 hours a day, seven days a week with no time off for good behavior.

Another fact that caused us to raise a critical eyebrow was the fact that these S/3 programmers had also written two assemblers, a Cobol compiler and 21 RPG compilers. This is the kind of expertise we would not have expected to find within a typical System/3 installation to say nothing of the fact that the economies of the situation would absolutely preclude any such development.

Quite frankly, we feel these figures are very suspect. This is especially true in light of the fact that the number of these complicated programs claimed to have been written *in-house* was rather high.

Independents Take Heart

The fact that these installations bought 76 application packages from IBM while they purchased 26 from independents is a good sign for the independent software companies. IBM easily offers over ten times as much software as all the independents put together. This seems to bear out our earlier contention that System/3 users are not as locked into IBM as other IBM users are.

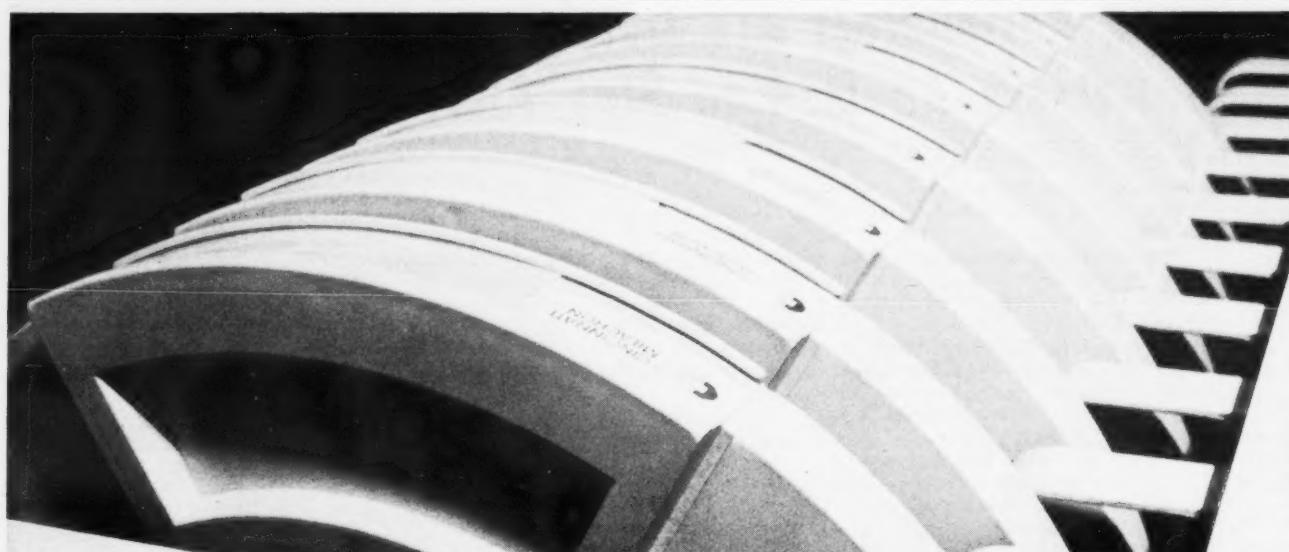
As far as the basic goal of the survey was concerned, "software satisfaction," nothing of an astounding nature was revealed. People seem to be more satisfied with software created *in-house* than when purchased from IBM or an independent. This can be easily explained from the point of view that the person filling out the questionnaire usually had something to do with making the decision to do it *in-house* in the first place. And, of course, there's the "not invented here" factor.

IBM, Naturally

IBM, by the way, scored significantly higher in the area of program creation packages than in application programs which, again, would only be natural.

This survey is not going to lay all the conjectures to rest, but it is somewhat comforting to note that even our universities are beginning to take notice of the idiosyncrasies of the System/3 marketplace.

Ferguson is president of Group/3.



Minicomputer SOFTWARE

Here's an exciting new operating system with RPG that dramatically simplifies and speeds data processing applications

CiMOS-22 is a disk-based operating system for the CIP/2200 minicomputers which consists of language processors, programming and debugging aids and services that simplify data processing applications. The capabilities of CiMOS-22 are packaged in a flexible system design so that each user can tailor the operating system to his individual needs. From either RPG or assembly language programs, the user can take advantage of the high-level data management facilities of CiMOS-22. These facilities include the ability to organize, catalog, store, retrieve and update data files. From a system console or assembler language program the user can create and delete disk-based files. On-line editing capability permits the user to build and maintain data files as well as source and object program libraries. There is much more to CiMOS-22 that you should know about. It's all detailed in our new brochure shown here... and it's yours free. Cincinnati Milacron, Process Controls Division, Lebanon, Ohio 45036.



FREE

minicomputers



CINCINNATI
MILACRON

Machine Tools
Process Controls
Chemicals
Plastics
Plastics Processing Machinery
Abrasives



★ More Storage for Your Buck ★

August 29, 1973

SPECIAL REPORT - Page 17

Storage Performance Depends on Two Factors

- Use of Mass Configuration
- Physical Limitations of Hardware

PHOENIX - A frequent problem faced by users is determining the best operating configuration for direct access subsystems, according to M.A. Diethelm, principal engineer, Honeywell Information Systems.

As disks and drums are generally slower than either main memory or the central processor, intelligent usage of these media can contribute markedly to the overall system performance.

Storage system performance is dependent on two parameters, Diethelm said, the use of the mass storage configuration and the physical limitations of the hardware devices.

Therefore, the first parameter (usage characteristics) must be measured before the total storage system performance can be estimated. The determination of storage use can be accomplished by considering the mass storage space as a collection of files of which some are permanent and some are temporary or dynamic (or scratch), Diethelm suggested.

This definition allows users to build a model of system usage consisting of each file listed with its known amount of I/O activity.

Locating Individual Files

The next step in predicting the system performance is to use this information to decide where individual files should be located in the existing system, or to perform simulations of proposed systems. The object is to maximize system performance by making the most-used files easiest and fastest to access, he said.

While this operation is not extremely complex, it does require the user to take measurements of the activity of the existing or proposed storage configurations.

These measurements can be obtained using either hardware or software monitoring techniques.

Hardware monitoring has the advantage of being non-interfering; that is, it adds no confusion to normal system operation during the measurement period, Diethelm commented.

But, he added, a severe disadvantage to the application of hardware monitoring is the elaborate and expensive equipment required to obtain the information on frequency of reference to addressable, specified portions of the mass storage.

Software More Flexible

A more flexible method of gathering the required information is through a software monitor. While this method does

create some disturbances in normal operations, it has the advantage of capturing data which can be analyzed after the fact, he stressed.

By way of illustrating the software technique, Diethelm outlined the use of a software monitor designed for use with Honeywell's GCOS operating system.

This privileged software obtains control at the time of initiation of any I/O command to gather measurement information to be used later in analysis. This information includes:

- Job characteristics
- Job and activity identification
- File identification of the file being referenced
- CPU time used for the job
- Physical I/O characteristics
- Subsystem, channel and device identification
- I/O command(s) issued
- Seek address
- Data transfer size

This information is processed by a separate program to produce a histogram of device and file space accesses, seek

Prepare for the Data Explosion

An attendee at a recent computer conference remarked that as the years passed, memories and disk systems have gotten larger and larger; but during the same period of time he had found it increasingly difficult to remember all the things he could when younger. This correlation led him to believe the total amount of memory in the universe at any one time is a constant.

Whether or not his observation is truly a physical law, we certainly are involved in a data explosion of Malthusian proportions. The new trend is to keep on-line records of every possible event or transaction. Further, we are entering an era of networking with large computers sending information across the phone lines resulting in the storage of data in multiple locations.

A defendable forecast is that over the next several years the amount of storage needed in typical systems will increase faster than any other system component.

The job of the user is to make sure the computer's data diet is digestible. This special report looks at ways users can get the most for their money, while making sure their systems don't bite off more than they can chew.

movement distances, device utilization and a cross reference listing of files accessed by job activities.

Having a set of mass storage files defined as well as a measured profile of the frequency of access to each, the next step is to postulate an allocation of these files to the mass storage subsystems.

In general the problem is to choose a subset of files which will fit the designated fast I/O device.

It is at this point that the user has the needed information to begin an evaluation of cost and efficiency of changing configurations.

The factors to be considered are whether the resultant speed of faster I/O devices (e.g., replacing disks with drums) is beneficial enough to offset the added cost of these devices.

The cost portion is basically a compari-

son of the cost of new hardware and system utilization cost at the higher speed versus the cost of the older, slower mass storage devices coupled with their system utilization charges.

Of course, this is a somewhat simplified view, Diethelm noted, as other factors may work to add new parameters to the decision such as if the user adds faster I/O, he may free some processing power for other tasks and avoid an upgrade.

On the other hand, if the system is underutilized and speed is not the primary consideration, faster devices may not be needed.

In any case it is up to the user to use the scientific evaluation techniques to gather his data, but from then on he must determine his own unique requirements as to how to get the most from his system at the least cost, Diethelm concluded.

Channel Keeps Data Flowing Smoothly

"The channel is the traffic cop - stopping and starting traffic - on a demand basis and ensuring that no collisions occur."

By Tom Knight

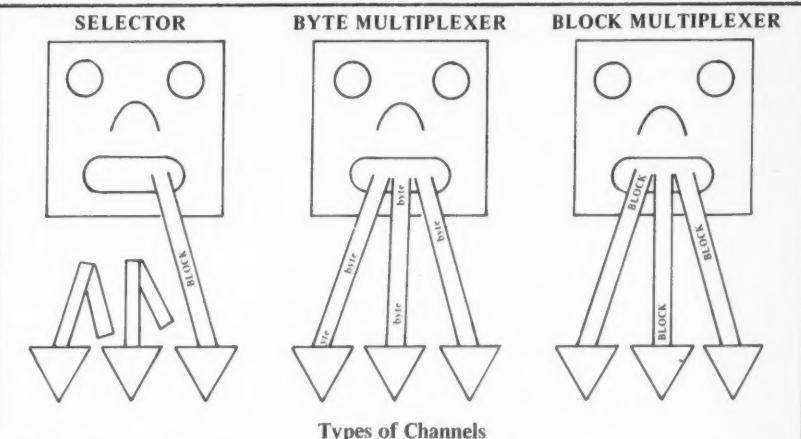
Special to Computerworld

A channel is a computer. It has its own memory and logic just like a central processor.

It is different from the CPU in that it performs a different function: coordinating the flow of information into and out of the central processor's main memory. This flow is said to take place over a data path or through a port in the CPU.

Users can think of the channel's data path as a two-way street that's wide enough for cars to travel in one direction at a time. The channel is the traffic cop - stopping and starting traffic on the street on a demand basis and ensuring that no collisions occur.

Once orders or commands from the CPU are understood, the channel does what it is told without tying up the central processor further. When the task is completed, the channel signals the CPU through a signal called an interrupt that



the specified I/O operation is complete. The signal is called an interrupt because it interrupts whatever the computer is doing for a time.

Channels connect to control units, some of which are in a box by themselves, and some in the same box as the I/O device. But regardless of where it is located, the controller function is the same: to control the locating, reading and writing of data on one or more I/O devices. When there is more than one I/O device attached to a controller, this function also includes making sure the right data gets to and from the right device.

The I/O devices - tape drives, disk drives, printers - follow the directions they receive from the controllers. They move access arms, select heads, move

paper, read or write data, as the control unit dictates.

The division of the I/O function into three separate functions - channel, controller and device - is arbitrary and dictated by IBM policy. On all 360 systems, IBM created a standard interface between all channels and all control units. It is this interface, or plug, that allowed compatible peripherals to be attached to IBM's CPUs.

Two Channel Types

IBM originally divided channels into two types: selector channels and multiplexer channels - now called byte multiplexer channels to differentiate them from block multiplexer channels.

(Continued on Page 18)

On the Inside This Week

RPS Saves Read/Write Time on Block Multiplex Device	Page 18
Star 100 Takes Modular Approach to Virtual Storage	Page 19
Floppy Disk Ready to Join Other Standard Media	Page 22
How Much Memory Can a Minicomputer Manage?	Page 22
Value of Data Should Determine On-Line Storage	Page 23

RPS Saves Read/Write Time On Block Multiplex Device

By Tom Knight

Special to Computerworld

Most controllers are like selector channels: they can handle only one request at a time.

If controllers for block multiplex devices, such as disks, had this restriction, in order to make block multiplexing work a controller for each drive would be needed. For this reason, all controllers for block multiplex devices are like multiplex channels and handle more than one request at a time.

This ability is called multiple requesting. The feature can be thought of as each controller having its own non-shared sub-channel for each drive attached to it. An area of the controller is set aside to store information pertinent to an I/O operation. As each device works through a separate storage area all the devices on a controller can operate concurrently.

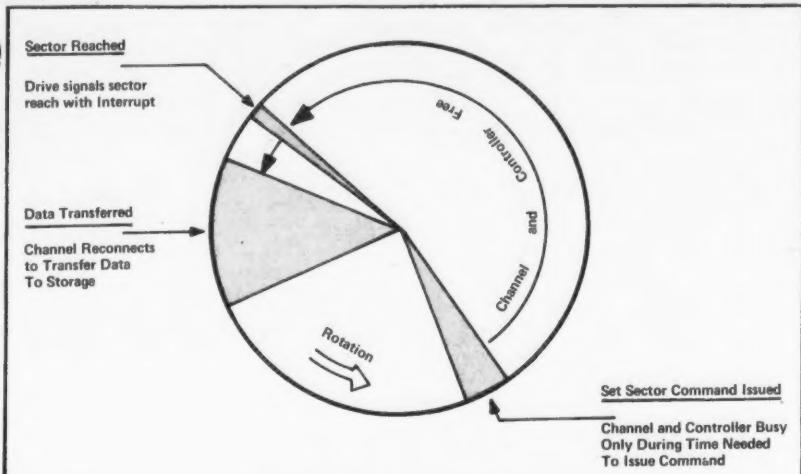
Rotational Position Sensing (RPS) is the key to making the block multiplex concept work. Rotational delay - the time wasted in disk operations while the device is waiting for the information requested to move to a position where reading or

writing can start - is the area in which block multiplexing saves time. RPS allows the device to signal the controller and channel when a block of information is ready to be transmitted, when the disk is about to rotate into a position where it can be read from or written on.

Several block (areas) can be located on a disk track - the area on a single disk surface on which information can be written or ready by a single disk head without head motion. Although a track is a circle, it has a logical beginning and end.

The beginning, which is sensed every rotation by the drive mechanism, is called the index marker. This is the reference point of the track. The location of everything else on the track is expressed relative to the index marker. This is true of all disks.

RPS disks go one step further in defining the layout of the track: it is divided into a specific number of sectors, the first immediately following the index marker. These sectors are used as reference points to locate blocks or areas on the track. It is by sector number that the RPS device knows when a block or area is upcoming



Rotational Position Sensing

on the rotating disk track, and thus, when the controller and channel should be signaled that the device is ready for data transmission.

RPS sectors can be thought of as "pie-shaped" wedges dividing the disk surface into an equal number of parts. It is important to realize that the number and size of sectors has no physical connection with the way data is organized on a disk track.

Blocks do not have to begin on sector boundaries or be an equal number of

sectors long. For this reason it is sometimes more appropriate to think of sectors as slices of time rather than space, the time being the rotational time of the disk device. The function of the sector is to allow the drive to signal the controller and channel when (not where) the block or open disk area is available.

Command Retry

Block multiplexing was divided in order to increase throughput - to save channel and central processor time. While already significantly cleaning up its direct access I/O procedures with RPS, multiple requesting and block multiplexing, IBM decided to go one step further and allow the channel and controller to retry failed I/O operations without notifying the processing unit: I/O recovery routines being implemented in the hardware instead of the software.

Errors involving data checks (unreadable data or parity errors) and overruns (data being read too fast for channel or main storage to accept) are thus handled by command retry.

This allows the block multiplex channel and associated multiplex controller and devices to handle soft (intermittent) data recovery problems. The CPU is interrupted with an error only if it is determined the error is uncorrectable.

IBM provides two controller/drive sub-

(Continued on Page 19)

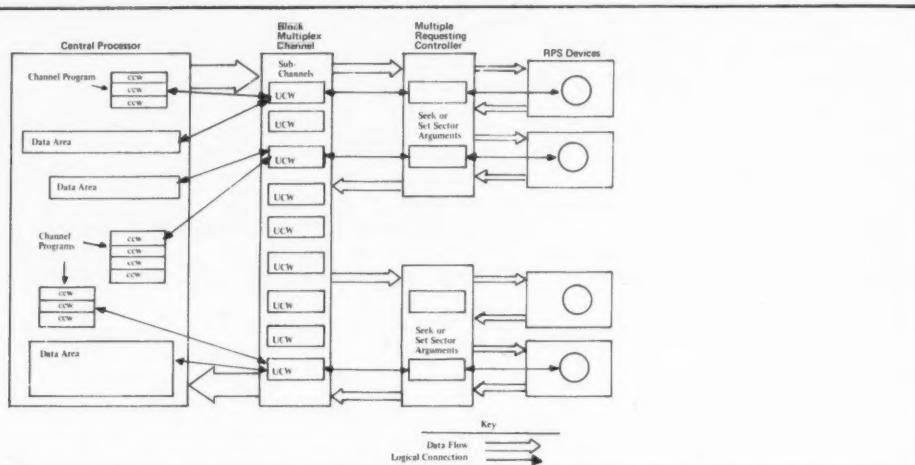


Figure 1. Block Multiplex Channel Operation

Channel Keeps Data Traffic Flowing Smoothly

(Continued from Page 17)

Selector channels are logically and physically active with only one device at a time, while the multiplexer channels are logically connected to several devices simultaneously and become physically connected to a specific device only while that device is actually transmitting or receiving data.

Typically, selector channels are used with high-speed devices; the reason being that since the channel locks on to only one device at a time, locking on for a short time to a high-speed device to transmit a large amount of data is more efficient.

Multiplexer channels are usually used with low-speed devices, because a single high-speed channel can coordinate the activities of several low-speed devices. This is accomplished by accepting one byte at a time from each of the simultaneously operating devices. In this instance, the controller takes on the added function of signaling the channel when another byte is ready for transmission.

A selector channel is said to operate in burst mode - the high-speed transmission of large bursts of data. The multiplexer channel normally operates in multiplex mode; however, when high-speed devices are attached, a multiplexer channel is forced to operate in burst mode. While in burst mode all devices other than the transmitting unit are locked out.

Multiplexer channel operation is much more complex than selector operation as the multiplexer channel must handle several requests at a time, while the selector

handles only one. This means multiplexer channels must have storage and logic to handle several operations concurrently.

The storage area in a channel used to hold an I/O command is called a subchannel. A selector channel can be defined as a channel with only one subchannel. The term multiplexer implies at least two subchannels.

A block multiplexer channel accepts blocks of data (instead of bytes) and has subchannels, the number of which determines the number of simultaneous operations that can take place.

Because block multiplexer channels can handle high-speed devices, it is sometimes appropriate to use them as selector channels (most of the 370 line has only one kind of high-speed channel, a block multiplexer). This is done by assigning a subchannel to a selector-type operation. Thus, the single selected subchannel acts as if it were a stand-alone selector channel.

Just like a selector channel, several high-speed devices can be attached to this single subchannel. For this reason, such a subchannel is called a shared subchannel.

Each device on a multiplexer channel (block or byte) capable of multiplex operations must have its own subchannel - its own area where command information can be stored. This type of subchannel is called a non-shared subchannel, because it is assigned to a specific device and no other device can use it.

Block multiplexer channels normally have only one shared subchannel as increasing the number of shared subchannels would not result in any increase in throughput, as only one of the subchannels could be active at any given time.

A byte multiplexer channel is capable of interleaving the bytes transmitted by several low-speed devices because the channel is several times faster than only one of the devices. This is not true of the block multiplexer channel as the data rates of the

devices being multiplexed on a block multiplexer channel are as high as that of the channel; therefore, only one device at a time can be transmitting data through the channel.

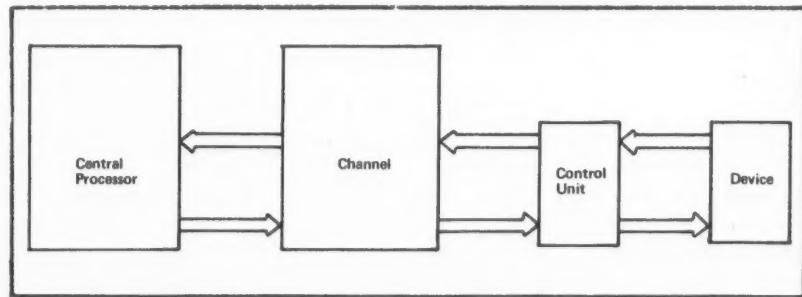
The block multiplexer channel was developed to handle high-speed direct access storage devices - in particular, high-speed disks. Operation of such devices on a selector type channel is inefficient, because more channel time is spent waiting for information to become available for transmission than is spent in actually transmitting data.

The block multiplexer channel, plus special features in the disk devices, allows multiplexing to occur such that the devices are attached to the channel only during the time data is actually being transmitted. Thus, several devices can concurrently be positioning themselves while one device is actually sending a block of data.

Block multiplexing is as much a function of the I/O control unit and device as it is a function of the channel. Tapes, for example, cannot be multiplexed. Compared to block multiplexer devices, tapes are slow and there is little wasted time in standard selector channel operations.

The controllers and devices used in block multiplexing are capable of special modes of operation not available on other devices: multiple requesting in the controller and rotational position sensing in the drives.

Tom Knight is systems engineering manager for Computer Investors Group.



IBM Standard Input/Output Architecture

Separate Stations Control Paging

Star 100 Takes Modular Approach to Virtual Storage

MINNEAPOLIS, Minn. — A crucial factor in the efficiency of a virtual memory computer is the speed at which the system can page information into and out of main memory.

The standard IBM approach is to control paging operations from the central processor. The Control Data Star 100 takes a different approach and is designed with "stations" physically separated from the main computer which control the paging operations.

This modularizes the total computing function into independent asynchronous tasks which operate in parallel with the CPU and results in faster paging rates than possible under a one system control plan, according to W.C. Hohn, senior design engineer at CDC.

A side benefit, Hohn stated, is that the modular approach simplifies central processor design and provides a means to

ter at the top and the rest of the table is core memory. The translate time in the 16 associated registers is one minor cycle (40 nsec).

When a hit is made, that entry jumps to the top of the table. Thus, Hohn noted, most frequently referenced blocks have entries near the top of the table and conversely, the best candidates for removal from memory are at the bottom of the table.

No Degradation

This paging mechanism acts to give the system a virtual memory capability without degrading system performance (100M results/sec), he added.

When the virtual address is not found in the page table, an access interrupt occurs and control is switched to the monitor. The paging stations contain the overflow pages from main memory.

Requests for drum transfers are made to the queue program, not to the driver directly. This program translates the drum block address into a head and sector address. If the resulting sector position is free in the associative queue, the request is placed in the queue; otherwise it is placed in retry mode and offered to the queue program periodically until accepted, he noted.

As the number of requests increase, the probability of filling more queue slots increases and raises drum throughput.

The Comparator

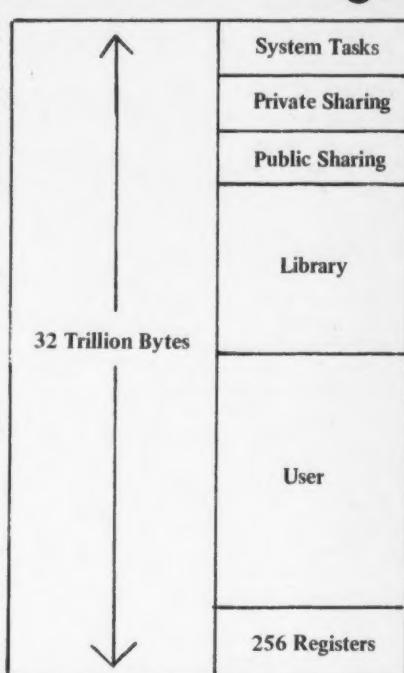
The virtual page table maps the drum(s) one entry per drum block. Each 64-bit entry contains a unique drum block address and is flagged as either free or attached to a virtual address.

The comparator is a hardware unit which compares selected virtual addresses against the page table entries. All entries move down as the search passes them unless a match is made. The entry that matches is placed in a now vacant slot at the top of the list, thereby generating in time a list topped by the most active entry and arranged thereafter in order of descending activity.

This form of page table maximizes performance, Hohn said, because the table is both compressed (all active entries at the top) and ordered by activity, two characteristics which minimize search time.

The table scan rate is one entry every 1.1 μ sec or 910K entries/sec.

The paging station (which includes the comparator) is driven by messages from the central processor. Essentially the paging station polls central memory for messages and on finding a group of active messages reads them into the SCU where they are processed.



CDC's virtual memory is designed to have most frequently accessed data dynamically located near the top so that search times are reduced.

sages and on finding a group of active messages reads them into the SCU where they are processed.

All code is reentrant and many messages can be processed simultaneously, Hohn noted. The average number of memory cycles needed to process a message such as Read Page is 3,000, he concluded.

RPS Saves Read/Write Time

(Continued from Page 18)

systems that support block multiplexing: the 3830/3330 and compatible systems, and the 3835/2305 and compatible systems. Both of these subsystems offer multiple requesting, rotational position sensing and command retry.

Figure 1 illustrates block multiplexing operation RPS devices illustrated is a situation with four devices, two controllers, a channel, and a central processor, with three concurrently active channel programs.

A channel program is a group of instructions that define an I/O request. Several instructions — called channel command words (CCW's) — are needed for a normal direct access device I/O operation because separate commands are needed to specify positioning or selecting a read/write head, setting a sector and the actual reading or writing.

The channel program is in the CPU's main storage. Also in main storage is the area to or from which data is to be transferred. This area is commonly referred to as a data area or data buffer.

When an I/O operation is started (by the CPU) the block multiplex channel assigns a subchannel to handle the request. The subchannel is sometimes also called a unit control word (UCW). The subchannel maintains a logical connection (main storage address) with the channel program it is executing. The subchannel remembers which CCW is currently being executed and where data is coming from or going to in main storage.

The subchannel, in turn, is logically connected with a controller that has multiple requesting capabilities. The multiple requesting controller retains the seek argument or set sector argument (the cylinder/head being sought or the sector being waited for by the drive) in its own storage while the CCWs to seek or set sector are being executed.

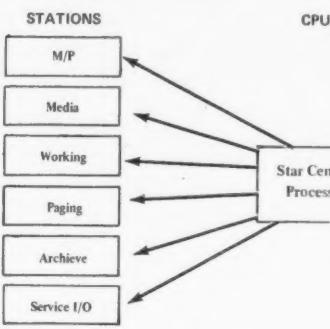
The drive executing such commands takes no channel or controller time while seeking or waiting for sectors. In this way, several disk devices can operate concurrently.

Tom Knight is systems engineering manager for Computer Investors Group.

OPERATING CHARACTERISTICS

* 10
* 10^9 per unit: 5:25 per unit
* 10^{10} : 40 : 40
* 10^9 : 40 : 1,000
* 10^{11} : 15 : 2

*Capacity (bits) : Transfer Rate (M bit/sec) : Service Rate (messages/sec)



The Star-100 System is arranged so it can perform 17 transfers/drum revolution where previous systems were able to perform only one transfer/revolution, according to CDC.

control larger numbers of storage devices and terminals.

Computer Unto Itself

Each station is a small computer system in itself, consisting of a Station Control Unit (SCU) and a Station Buffer Unit (SBU). The SCU is a minicomputer with a small drum subsystem and display console. The SBU consists of 64K bytes of core memory and acts as a buffer unit, holding data ready for transmission to the central processor on request.

The M/P station manages maintenance and performance analysis of the mainframe processor.

The media, working and paging stations consist of tapes and disk packs, large disk and drums respectively.

Each user has four keys, Hohn said, which reside in the program's control package and provide four levels of access protection in virtual memory.

Global Page Table

There is one global page table for all users with one entry for each core page. There are two page sizes: normal (4K bytes) and large (524K bytes).

The page table has 16 associated regis-

ters at the top and the rest of the table is core memory. The translate time in the 16 associated registers is one minor cycle (40 nsec).

When a hit is made, that entry jumps to the top of the table. Thus, Hohn noted, most frequently referenced blocks have entries near the top of the table and conversely, the best candidates for removal from memory are at the bottom of the table.

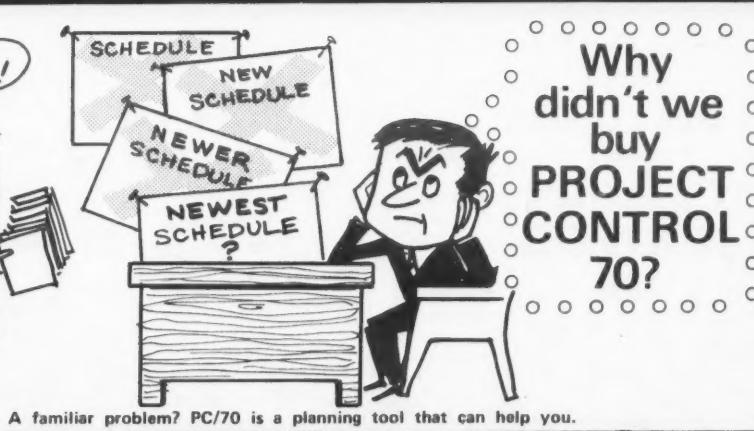
Buffer Space

One half of the 16-page SBU contains the virtual page table and the other half (minus some drum control space) is used as a buffer space for the drum/central page transfers.

In order to ease the SBU memory conflict situation, Hohn added, the SBU memory is hardwired to operate as two independently phased memories with a width of four 16-bit words every 1.1 μ sec. In this manner the comparator has sole access to its half of memory and the drums and channels complete in their half, with the drum having top priority.

All hardware interfaces — drums, comparator and channels — are controlled by routines residing in the SCU. The SBU provides a data freeway for page flow from the drum to central memory.

Having the SBU between central memory and drum reduces channel design complexity, Hohn said, by not having it interface to critical, real-time, rotating devices.



A familiar problem? PC/70 is a planning tool that can help you.

Contact: Robert P. Wolk, V.P.

Atlantic Software Inc.
Lafayette Building, 5th & Chestnut Sts.
Philadelphia, Pa. 19106 • 215-925-8424

Please send us literature about PROJECT CONTROL/70

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone (_____) _____

6250 BPI? Epoch 4 is

Epoch 4 was far ahead of its time when Graham Magnetics developed it.

So if you're getting ready to phase in the newest generation of high-speed, high-density drives, you can rest easy as far as computer tape goes.

Epoch 4 users are in a class by themselves because its high thermal stability, low surface friction and extra-high data density enable it to perform just as well as the latest high speed drives as it has for years.

CERTIFIED
ZERO
DEFECTS
3200 FOT
1600 BPI

GRAHAM MAGNETICS

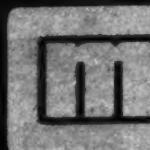
EP0CH 4

NETICS

1000
00
00
900
800
00

is ready when you are.

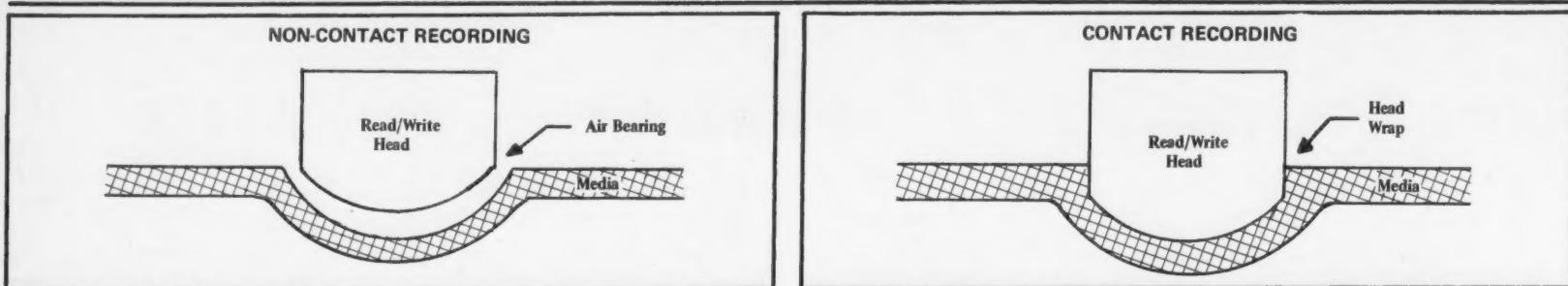
...e in an enviable position,
aterial properties, low sur-
extra-high packing density
just as well at 6250 BPI on
s it has at 1600 BPI.
4 is ready when you are.



**GRAHAM
MAGNETICS**

Graham, Texas 76046





With a flying head disk, an air bearing creates a gap between the head and the mylar media.

Floppy Disks Ready to Enter Standard Media Arena

By Robert A. Cantarano

Special to Computerworld

Since mid-1972, there has been a great deal of interest, but as yet limited use of hardware systems incorporating floppy disk technology.

Most of the activity has been by Original Equipment Manufacturers (OEMs) developing turnkey systems. Examples of such systems under development are programmable calculators, power typing, intelligent terminals, word processing, process control and small business systems.

Quite possibly these systems will be announced for delivery in late 1973 or early 1974. Currently several firms are shipping point-of-sale and source data entry systems utilizing floppy disk memory drives.

With the increased application and utilization of floppy disks, many think the floppy disk is about to break out and join other standard media such as tape cassettes and drives and hard disks as a component users can choose to fit their computing needs.

In order to understand which specific needs the floppy disk is best suited to fill, it is useful to see how it was born and how it has been raised to its present point.

During the 1960s many end users worked toward evolving various forms of management information systems characterized by centralized records and files. At that time, this approach was con-

sidered the best available solution for handling large amounts of data coming from various locations.

While the major push was for centralization, a counter group was of the opinion that distributive data bases or decentralization of many records and files was a viable alternative.

[Lower cost] provides a great incentive to produce disk subsystems using floppy techniques that make on-line data storage inexpensive enough for users to follow the decentralized philosophy of data handling."

Significant among the companies questioning centralized MIS approaches were the minicomputer and miniperipheral companies who felt the technology existed to give users a computer capability other than in the form of a large centralized computer.

But to a large degree, industry norms were set by the equipment and software provided by the larger firms. Thus, users developed attitudes set by large system vendors.

With floppy disks users can usually choose the best of the centralized approach mixed with the best of the decentralized approach to construct a system according to their needs.

Technically, floppy disks were born to serve a program load function in a disk or tape control unit — for example, IBM's

3330. In the beginning, no one thought of using them for other applications.

As other firms built 3330-type replacements they also had to make the floppy disk for their own program loads. In doing this they had to develop the ability to write on the disks.

With this capability in hand, these other firms began to examine other applications for which the floppy disk might be used.

An ideal application for the new technology would be in the development of disk subsystems inexpensive enough to be used in support of satellite processing operations — e.g., to support a remote intelligent terminal, providing data buffering, program storage and the capability to format and preprocess data on the disk. Further, it provides for summary (or whole-file) type of inquiry information at the source.

What the firms had to build upon was a recording media constructed of standard mylar used for magnetic tapes. The difference is the floppy disk mylar tape sheet is cut into a disk, much like a 45 rpm record, and not strips.

The record, track and sector formats are the same as for hard disks, but floppy disk recording media (mylar) is about 1/60th the cost of comparable hard disk recording media (metal).

Cost Great Incentive

This cost differential provides a great incentive to produce disk subsystems using floppy techniques that make on-line data storage inexpensive enough for users to follow the decentralized philosophy of

data building.

But before users could jump aboard the cost-savings bandwagon certain technical areas had to be smoothed out, a process that is still in effect.

Floppy disks had previously been used with the read/write heads in contact with the mylar surfaces during read operations.

This approach was acceptable when the disk was not being used much as in the 3330 program load. But as the disk is used more, frictional problems can result in a form of scouring and contamination: specifically data degradation.

The alternatives to contact heads are either to fly the heads (as in standard disk operation) or to fly the media using air suspension to keep it physically separated from the heads. Most firms are opting for this approach.

Another consideration is the difference between non-contact start/stop and contact start/stop. Under contact start/stop the mylar disk makes contact when the drive is powered up and maintains contact when the drive is powered down. Again this process can lead to friction and resulting problems.

One of the major selling points addressed by IBM in selling its floppy disk-oriented system (contact recording) is the ability to handle and mail floppys from one location to another.

The user's operating environment is a work situation in terms of operator-oriented systems and environmental conditions. There are several factors that could minimize data reliability problems.

(Continued on Page 23)

How Much Memory Can a Minicomputer Manage?

OCEANPORT, N.J. — How much memory is too much for a minicomputer?

As minicomputers are made with faster internal speeds for the central processor, a user might well ask: Why not buy a minicomputer with a CPU speed faster than an IBM 370/135, give it 256K bytes of memory and have a system which costs about 25% of the IBM system but is faster?

Obviously there is some limit beyond which adding memory is not practical. For example, a 16-bit minicomputer is ill-equipped to handle a 1M-byte memory, according to James Folts of Interdata Corp.

To understand why the conventional mini can't handle 1M bytes of memory and to find an answer to the full question of how much memory is enough, Folts stated, it is important to understand the history of minis and how the past has acted to build in limits on the present models.

The early minicomputers were designed to provide the cheapest possible tool to solve computing problems. In this design, instruction sets were kept small, since to add new instructions would have meant adding the required control logic hardware. In an effort to keep costs down the traditionally small instruction sets are one parameter acting to limit the amount of memory a minicomputer can effectively handle.

The second criterion also comes from the cost conscious days when the num-

ber of registers was kept small to keep costs down, he added.

And the third and most stringent restriction is purely mathematical. A 16-bit minicomputer can only address up to 64K bytes of information. Any location beyond this 64K-byte limit requires more than 16 bits to represent its address, he continued.

For simple computing, these limitations are not that important. As applications become more complex, however, the impact of a limited instruction set becomes more marked.

At some point it may take seven or eight instructions using the smaller set to accomplish the same act as one instruction of a larger set. If the standard minicomputer adds additional instructions (as they have), this acts to add to the cost and complexity of the architecture, Folts contended.

There is one way out of the instruction set bind, and that is to use microcoding, Folts said, as increasing instruction sets does not markedly affect machine architecture or cost.

The conventional minicomputer has two or four registers compared with eight or 16 for the medium-scale computer.

The number of registers directly affects the number of operations the computer can perform during a given time period, Folts said. At some point, it is not economical to keep information in main memory if the system must wait for the CPU to catch up.

Microcoding and other hardware or

software techniques will not buy the user away from this problem, he said.

The most striking restriction, though, is the 16-bit minicomputer's ability to address only up to 16K bytes. To the user this limitation means that he can only run programs that do not exceed the 16K-byte limit, Folts noted. This is a real restriction as in the case of a Fortran compiler that can take up to 60K bytes if it includes features such as reentrant capabilities or global optimization.

Even if the user gets a stripped down compiler he is limited, Folts said. "For example, a 100 by 150 real array in Fortran would require 60K bytes for the data alone, which would leave 4K bytes available for the rest of the program and compiler."

There are ways to overcome this by using software to map and overlay portions of the larger programs, but this acts to make system operation markedly more complex and much slower, he said.

Every time a mapping operation is needed the program must go through the operating system, he noted.

While the mathematical limit set by the registers in turn sets a limit on the size of programs that can be run effectively, it does not set the limit on the number of 64K-byte programs that could be held in memory simultaneously by a 16-bit minicomputer.

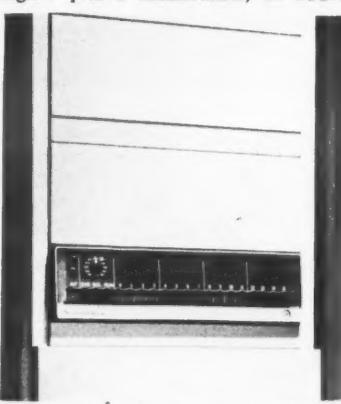
In most cases, added memory is attached via a Memory Segmentation Unit that includes a group of eight

base registers. These registers allow the computer to physically address up to 256K bytes.

But operationally for any one program, the limit is still only 64K as that is all the central processor is capable of addressing, Folts said.

When can a minicomputer with extra memory take a job away from a classical medium-scale computer? Only when the inherent restrictions of the instruction set, number of internal registers and addressing capability do not make user applications impossible or impractical, Folts said.

For these users, the cost advantages run from 50% to 75% to perform the same results in the same time as the higher priced mainframes, he added.



How much memory can this box handle?

Remove Old Information, User Suggests

Value of Data Should Determine On-Line Storage

BALTIMORE, Md. — One small system user here believes a major storage consideration is the value of the data kept on-line.

"Data has a way of just growing like crab grass if left unchecked," said Ed Neff, DP manager for American Trading and Production Corp. To keep the system healthy and responsive he has developed a system to check the timeliness of data and remove information that is old and useless.

Neff's system is built around an IBM System/3 Model 10 with a 9.8M-byte disk subsystem. Most of the disk space is used for files that relate to individual customers, specific products, accounting information and vendors.

Of these, the most significant in terms of size and use are the customer and product files, Neff said.

Each of these files in turn is broken down into fields. For example, in the customer file, major fields include sales this year, sales last year and open orders (orders which have been received but not filled).

To make sure the company is not paying to keep information on-line that is no longer useful, Neff has written a program (in RPG II) that is used to periodically check the currentness of all files.

Orders This Year?

In the case of customer files, the program calls in each individual customer file and checks to determine if there have been any entries made in either the sales this year or open order fields.

If an entry had been made in any one of

Floppy Disks Finding Their Place in I/O

(Continued from Page 22)

For example, dust covers and sealing the floppy drive help prevent dust and other contaminants from entering the drive. Also, it is best to have the mylar come in minimal contact with human hands.

Other considerations for the user are compact size, weight, power requirements, one drive motor versus two or more per drive and most importantly cost and reliability.

Without a large user demand at this time, it is impossible to set price ranges except to say that for the OEMs, the several floppy drives minus interface and controller considerations range in price from \$500 to \$5,000 per drive.

Capacity, or bytes of storage, is a function of the application system. Floppy disks are flexible enough that users can have a system built to almost any requirement — maximum about 1M bytes.

Cantarano is vice-president of Data Education, Inc., Waltham, Mass.

About the Author

This special report was prepared by Michael Weinstein, Computerworld's systems editor.



"Well, let's run it up the flagpole and see who drags it down to burn it."

these fields the file is returned to disk unaltered, Neff said.

On the other hand, if no entry had been made, the name of the customer and the file location are written into a temporary file. Then a "d" is written onto the inspected customer file in the field that determines the activity status before the file is returned to the disk.

When all files have been queried, Neff said, the temporary file of all customers who have made no transactions during the previous year is printed out and taken to management for review.

Management reviews the list and advises the computer department if there is any reason why any of the customers listed should not be deleted from on-line status.

This review allows a human interaction that has proved valuable above and beyond the mere computation activity of the computer program, Neff said.

For example, a given customer might be

building new stores and has told management that he will soon be increasing his orders. Management can then advise the

"Data has a way of just growing like crabgrass if left unchecked."

— Ed Neff

DP department to keep this customer active, he continued.

After the list is signed off by management, the "d" in the selected files (those to be kept on-line by management recommendation) is changed to an active code, Neff said.

For the rest of the "d" files, a program now changes the "d" to an "x." Those customers with an "x" in the status field are left on-line for one more day and if no change is directed a program pulls all files that have the "x" coding and punches their contents onto cards.

The punched cards are kept as a backup

record in case the customer reorders at a later date.

Keeping the Record Straight

One more activity is performed before the contents of an "x"-rated user's file are erased from disk, Neff said.

If the customer did not order this year but did order last year, the amount of his order and the products ordered are moved to a cumulative file. These numbers are the only fields moved, but they permit a determination of total sales by product for the previous year and are useful for comparative studies, Neff said.

With this information vital to the firm still on-line, the program now erases the non-essential information by erasing the "x"-rated user's file.

If that user ever comes back into active status, it is easy to reload his information from the punched card back-up, Neff stated.

Jim Crough of Memory Technology...



can show you how to save \$10,000./\$15,000. per month and more with your IBM 370/155 or 370/165

How? It's simple. Just replace the memory portion of your current computer system by plugging in a semiconductor memory money saver: the MTI-755 or the MTI-765. They're fully compatible with your computer system.

So far, so good. You get the same memory horsepower and you start saving immediately.

How about memory expansion? That's easy too. Memory Technology can increase the size of your IBM 370/155 or 370/165 up to 4 MB. That's a lot. And from a financial point of view, you can live a lot longer with your current computer and have it do more. Doesn't that make investment sense? We think so.

Installation time. Fast. Typically, less than 8 hours to install a 2 MB semiconductor memory on your 370/155; a shade longer for your 370/165.

Responsibility? Memory Technology is an American Research and Development Company, a Division of Textron Inc. With over 10,000 memory systems delivered, Memory Technology is one of the only memory system manufacturers to take full responsibility from engineering, manufacturing and marketing through maintenance.

Want to really make your computer system pay off? Call Jim Crough, (617) 443-9911, Memory Technology Inc., 83 Boston Post Road, Sudbury, Mass. 01776. He'll give you all the facts. Or, send for our new brochure.

MemoryTechnology



Memorex shatters the cost of tape library systems.

If you wish to automate a tape library containing 300 to 10,000 reels, it can cost you up to \$4,000 or more... or it can cost you nothing!

Memorex has created an automated tape library system for customers that utilizes IBM ANS COBOL language which is compatible with both OS and DOS systems. It can be adapted to interface with SMF. The Memorex Tape Management System automatically inventories the

total library each day and features a built-in error detection system that kicks back improperly coded entries. A number of essential and extensive reports are generated on a daily basis to keep you in full command of your library.

The complete software package contains a user manual and reel of tape which has been encoded with sample Job Control Language and Source Code. All of this is part of the continuing Memorex commit-

ment to provide quality products and superior customer service. Ask your Memorex Representative to explain how you can shatter the cost of automating your tape library.

Memorex Corporation M/S 0064
1125 Memorex Drive
Santa Clara, CA 95052

MEMOREX

Afips Sets Guide for NCC Papers

CHICAGO — Afips has issued formal instructions for the submission of papers for the 1974 National Computer Conference and Exposition (NCC), to be held here May 6-10.

The deadline for submitting advance abstracts is Oct. 1.

New, hitherto unpublished papers, presenting original developments or of a tutorial nature, are being solicited. Total

Societies/ User Groups

length of the work should not exceed 5,000 words, with each illustration counted as 300 words. Each paper must include an abstract of a maximum of 150 words.

Five copies of each manuscript and abstract must be submitted and a full set of illustrations properly keyed to the text must accompany each copy.

"Special emphasis will be placed on papers and presentations on developing new technology, innovative concepts and

areas holding promise for the future," said Dr. Stephen S. Yau, conference general chairman. "Attention will also be focused on the effective use of our computers, our time and our people."

Suggested topics include computer architecture and hardware; software systems; computer networking; information management systems; management acceptance (including systems evaluation, systems performance, auditing of results and assessment of direct costs).

Applications of data processing technology will cover communications systems; health care and biotechnology; education (all levels); small and large manufacturing; distribution; retailing; government; finance — banking/insurance/investment; industrial process control and transportation.

Completed papers must be received by Nov. 15.

All abstracts and manuscripts should be submitted to Theodore M. Bellan, 74 NCC Program Chairman, Vice-President, Computer Services, McDonnell Douglas Automation Co., P.O. Box 516, St. Louis, Mo. 63166.

Conference Views Micrographics

CW West Coast Bureau

LOS ANGELES — Comtec, a computer micrographic technology users group, has scheduled a conference Oct. 8-12 in St. Louis.

Al Aron, president, said the meeting will be held at Stouffer's Waterfront Inn and will feature seminars for novices and veterans in the field.

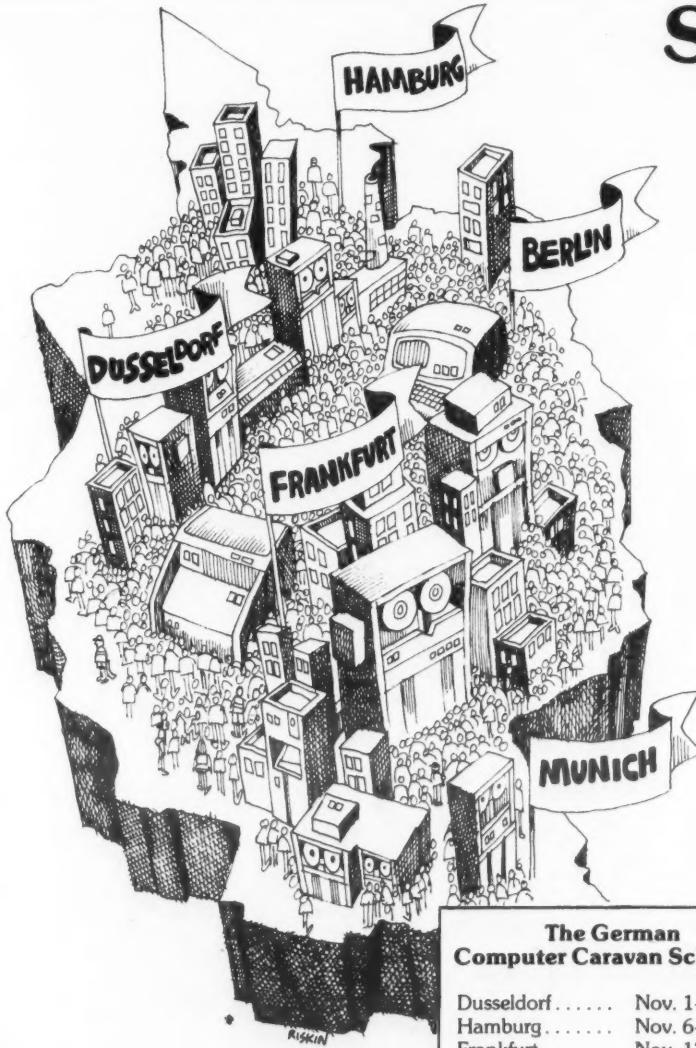
The first two days will be devoted to giving an introduction to COM from hardware, software and systems viewpoints, Aron said.

The next three days will focus on developments in COM and how users can increase capabilities, he said.

Don Gerlich of Information International, Inc. is overall program chairman. Cost of the first two days will be \$10 and the following three days, \$15.

Information about the conference can be obtained from Comtec, P.O. Box 25605 West Los Angeles, Calif. 90025, or from Aron at P.O. Box 80848, Mail Zone 622, San Diego, Calif. 92138.

Aron, who is with Convair Aerospace, San Diego, said that Comtec's board of directors has agreed to table all discussion of any affiliation with the National Microfilm Association until the situation is clarified.



u-ti-l-i-ty (u-ti'l-e-ti), *adj* 1: capable of serving as a substitute in various roles... 2: kept for the production of a useful product rather than show... 3: designed for general use *n* 4: the quality or state of being useful.*

* BY ANY DEFINITION (EVIN FROM WEBSTER'S SEVENTH NEW COLLEGIALE DICTIONARY), **UCANDU™** IS A UTILITY.

1. **UCANDU** CAN REPLACE MANY SPECIALIZED FILE COPY, RECORD SELECTION, TEST FILE GENERATION, DATA SET BACKUP, AND FILE REORGANIZATION PROGRAMS NORMALLY USED IN AN INSTALLATION.
2. THE USEFUL PRODUCT MIGHT BE A COMPLETE FILE COPY, A LISTING OF FIELDS SELECTED FROM A FILE, A RANDOM SAMPLING OF A FILE, A GENERATED TEST FILE, OR A DUMP OF A PORTION OF A PRODUCTION OUTPUT FILE.
3. ALMOST EVERYONE IN THE ORGANIZATION — OPERATIONS PERSONNEL, APPLICATIONS PROGRAMMERS, SYSTEMS PROGRAMMERS, AND AUDITORS — IS FINDING DOZENS OF USES FOR **UCANDU**.
4. **UCANDU** MUST BE USEFUL, SINCE MOST INSTALLATIONS THAT ACCEPT OUR FREE TRIAL OFFER DECIDE TO KEEP THE UTILITY.

UCANDU is a generalized utility which selectively lists, dumps, and copies OS/360/370 files. It is device-independent and processes both sequential and indexed sequential data sets. A simple, free-form parameter set provides data selection based upon record content, position, or both.

INTERESTED IN KNOWING MORE ABOUT **UCANDU**? LET US TELL YOU HOW YOU CAN TRY THE UTILITY FOR 30 DAYS, WITHOUT OBLIGATION. JUST LET US KNOW.

Gulf Oil Computer Sciences, Inc.
P. O. Box 2100
Houston, Tx 77001
713/228-7040



Sell Europe's largest EDP market this November.

The Computer Caravan is a travelling computer users' forum and exposition that has created a whole new form of EDP marketplace, with a proven record of success. Two U. S. Caravans have produced a total attendance in excess of 50,000, and a remarkable sales record. Now we're going to Europe — starting with a four-city English Caravan in September, and a five-city German Caravan in November. Next spring, we'll follow with a French Caravan.

But we're not simply taking our American ideas and customs abroad. We know that the needs of EDP users differ from country to country, and we've arranged for local sponsorship and guidance for each European Caravan.

In Germany, a leading EDP marketing organization, AMS Market Services, will be in charge of Exhibit Management and Sales. Dr. Gerhard Maurer, a widely respected EDP expert, will manage our Forums; and promotional support will be provided through leading EDP trade publications.

Germany is Europe's largest EDP market, and the German Computer Caravan is a unique, new way for your company to increase its sales there. To get a free brochure, just send in the coupon below. We'll send out the details right away.

TO: Neal Wilder
Vice President, Marketing
Computerworld
797 Washington Street
Newton, Mass. 02160
(617) 332-5606

Please send me further details on the European Computer Caravans.

Name _____
Title _____
Company _____
Address _____
City _____ State _____ Zip _____

The European Computer Caravans sponsored by COMPUTERWORLD

The IBM 1130 - if you have one, keep it; if not, get one!

LIBERATE the inherent power and capability of the IBM 1130 System with Logicon enhancements — add-on core, high-speed printers, disk drives, tape system — increase the throughput up to 10 times and still enjoy the confidence that is yours with an IBM CPU and IBM maintenance.

INTERFACE your 1130 with up to 32 terminals simultaneously — CRTs, teletypes, analog or digital sensors, IBM selectrics, keyboards, counters, time-of-day clocks, etc. — with the LI/ON (Logicon Input/Output Network) designed specifically to let you communicate with the 1130.

SAVE dollars on your computer operations. In many cases, Logicon enhancements combined with the reliable, powerful IBM 1130 system will permit you to do much more work for much less money than you are now spending.

NO MODIFICATIONS are necessary with Logicon 1130 add-ons and peripherals. You don't have to violate the internal hardware integrity of your IBM 1130 system nor are source program changes required. All operations are within the framework of the disk monitor (DM2) system.

LOGICON is the world's largest supplier of IBM 1130 enhancements. Logicon peripherals, add-ons and communications interfaces are 100% compatible with the IBM 1130 system because they are specifically designed for the IBM 1130.

WHERE do you find out more about how you can continue to enjoy IBM dependability and service and still reap the benefits of increased throughput, greater capacity, higher speed, job flexibility and a lot more at a low, low cost. Call or write one of our nationwide offices listed below:

LOGICON/INTERCOMP

24225 Garnier Street, Torrance, California 90505
Telephone (213) 325-6060

68 Rogers Street, Cambridge, Massachusetts 02142
Telephone (617) 864-4700

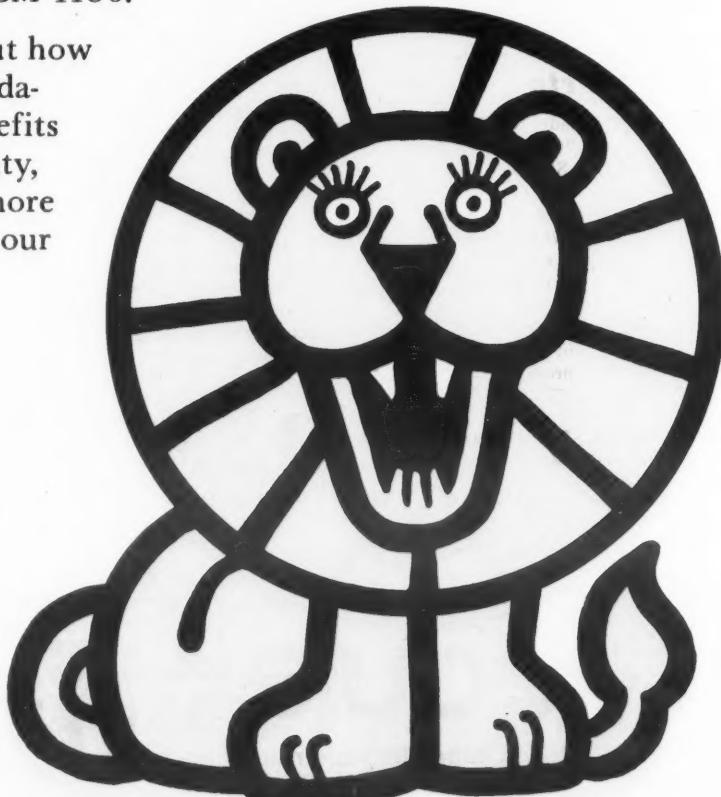
Chicago O'Hare Aerospace Center
4849 N. Scott St., Suite 413, Schiller Park, Ill. 60176
Telephone (312) 671-5455

6200 Hillcroft, Suite 112, Houston, Texas 77036
Telephone (713) 772-6636

99 Jericho Turnpike, Suite 301, Jericho, N.Y. 11753
Telephone (516) 997-3888

Williamsburg Bldg., 22100 Mastick Road
Fairview Park, Ohio 44126
Telephone (216) 777-6648

6231 Leesburg Pike, Falls Church, Virginia 22044
Telephone (703) 534-7087



COMPUTER INDUSTRY

CI Notes

Univac to Enter POS Arena

NEW YORK — Univac has entered the point-of-sale arena with the acquisition of a developmental supermarket system from RCA.

In addition to rights to the system, Univac said it will hire a number of RCA employees who have been developing the system.

The acquisition consists of two basic types of checkout devices, automatic scanning and key entry. The scanning system uses a laser beam symbol scanner-reader. Both types will have a dual mini-computer with disk storage, software and key entry cash register.

California Bid Fate Undecided

CW West Coast Bureau

SACRAMENTO, Calif. — The bid by IBM for the Stephen P. Teale Consolidated Computer Center meets the state's specifications but its fate is still up in the air.

An evaluation and recommendation committee had adjudged that IBM had "responded positively to all requirements in the invitation for bids and is committed to meeting all schedules."

IBM also committed itself to a fixed price, although state officials said they would not open the cost information portion of the bill until a bill can be passed by the legislature making it possible for the state to accept the bid.

Univac, ISS Complete Pact

NEW YORK — Univac has acquired Information Storage Systems (ISS) from Itel Corp.

Univac made an initial cash payment of \$23 million to Itel. Additional cash payments will be made contingent upon, among other things, sales to customers other than Univac during the balance of 1973 and the full calendar years of 1974 and 1975.

Memorex Cuts Work Force

SANTA CLARA, Calif. — Memorex Corp. revealed it has cut the size of its work force by about 1,000 persons at all levels and areas of operation to reduce its operations.

The number includes a layoff of 300 persons Aug. 17.

Supershorts

Shugart Associates has made its first product shipment, the SA900 Diskette Storage Drive, to Four Phase Systems.

Computer Machinery Corp. has signed a distributorship agreement with Informatica Nacional, S.A., for sale and service of its Keyprocessing Systems in Mexico.

Sanders Data Systems has selected Veritas International, Inc. to aid in developing international markets for its products.

Hardware Report — Part II

Japan Seen Rivaling U.S. Technology

By E. Drake Lundell Jr.

CW Washington Bureau

WASHINGTON, D.C. — Japanese computer hardware is rapidly approaching the technological level of its American counterpart, according to the recent report of the computer technology resources panel of the Computer Science and Engineering Board of the National Research Council.

The report of the now defunct group found that the major reason for the rapid buildup of Japanese computer expertise has been the major funding provided by the government, which supported one project between 1967 and 1970 with \$24.1 million and has earmarked \$97.2 million for the follow-on project to be completed in 1978.

Previously, most of the Japanese-produced computers were produced under license from U.S. manufacturers and there was little indigenous research in the country, the report said.

But now the Japanese are developing their skills in almost every area.

For example, in the large-scale area, previously almost the sole bastion of American-made machines, "the percentage of domestic computers in use is gradually growing as the Japanese ability to produce large high-speed machines is perfected."

Super Machines Due

Presently, the report said, most growth is at the low end of the large-scale range of equipment, but it estimated the Japanese would be producing super-scale machines with the completion of the Japanese national computer project.

There is still a large market in Japan for

U.S. minicomputer makers, but this market might not last long as the Japanese become more proficient, the report noted.

In addition, minicomputers might be the area that the Japanese will use for a large-scale penetration of the world marketplace.

Noting the similarities between the minicomputer and the electronic calculator, "one can surmise that the existing desk-calculator sales, marketing, and service organization throughout the world may well be utilized for the export of minicomputers," the report observed. In three years the Japanese calculators reached over 70% of the world market.

"The potential for Japanese export of minicomputers should not be ignored," the report said.

Many U.S. figures have noted the major area where the Japanese lag behind the U.S. as peripheral equipment, but the

report warned this might not necessarily be true.

"At the moment the Japanese appear to have the technology and capability to produce peripheral equipment comparable to anything produced in the U.S., although possibly at this point in time not necessarily at competitive cost," the report noted.

"Finally, the major infiltration of the U.S. market and consequent undermining of the U.S. manufacturers' position through the original equipment manufacturer (OEM) of peripherals by Japan must not be overlooked," the report said.

"While this situation should stabilize as Japan is recognized as the competition, the Japanese ability to compete costwise, either by pricing based on greater volume or by planned policy, could result in Japan obtaining and holding a major piece of the 40% of the U.S. market that is non-IBM."

GSA Report Indicates Success Of Basic Ordering Agreement

CW Washington Bureau

WASHINGTON, D.C. — A preliminary report by a study group in the General Services Administration found that the use of the "Basic Ordering Agreement" for software services has been successful and that its use should be spread to areas other than metropolitan Washington where the experiment was conducted.

The program standardizes job descriptions for programmers, analysts, communications specialists and other subspecialties in the software field and requires firms to submit hourly rates for each grade in which they had competence.

For example, if a firm wanted to do business with government agencies covered by the order, it would submit a master schedule of the hourly rates it would charge any government agency for those services.

Under the first year of the program it was reported that almost \$3 million worth of orders were placed with the more than 100 firms that had signed up for the Basic Ordering Agreement, according to the GSA study.

But, the study indicated, only 39 firms received any business under the contract, while 66 on the list did not. In addition, it was found that almost \$2 million worth of business under the BOA went to nine firms.

A total of 26 federal agencies used the BOA to get needed software expertise during the year, and eight of the agencies issued contracts that totaled more than \$100,000.

From the top eight agencies issuing contracts came 75% of the business since they issued contracts with a value of over \$2.3 million as a group.

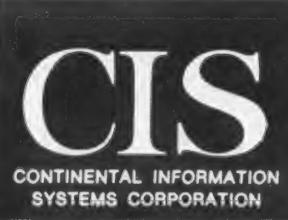
While the preliminary report from GSA favored continuing the program and perhaps expanding it to other areas of the country, there are reports here that some GSA officials are opposed.

In addition, some sources have indicated that some of the contract software houses in the Washington area do not favor the contract, even though no one is speaking against it publicly.

New System 370's Attractive Delivery Schedules.

For Sale or Lease. Terms: From 3 Years.
ITC Available. Contact Ed Tibbits or Dean Harrer.
at (315) 474-5776

SYRACUSE, N.Y. Midtown Plaza 13210 (315) 474-5776



Delivery Schedules

370/145 Model I2	Immediate Delivery
370/158 Model J	
#1 Delivery	11/16/73
#2 Delivery	11/16/73
#3 Delivery	1/18/74
#4 Delivery	2/15/74
#5 Delivery	2/15/74
#6 Delivery	3/22/74
370/168 Model K	
#1 Delivery	4/19/74
#2 Delivery	5/17/74
#3 Delivery	5/17/74

Xerox Marketing Plans Focus On Growth of Multi-Use Systems

By Marvin Smalheiser

CW West Coast Bureau

EL SEGUNDO, Calif. — Multi-use computer systems are emerging as a major marketing strategy at Xerox computer operations.

John (Jack) Bonne, multi-purpose marketing manager, said the focus is on the user who is going to a second computer or an outside service bureau.

Xerox's market effort, Bonne said, is aimed at normal commercial or manufacturing companies.

"Generally, we're shooting at manufacturing firms which have a combination of batch and on-line requirements and further divided the batch and on-line requirements into administrative and engineering workloads."

"Anyone who is headed towards a terminal-oriented system would be wise to look at a multi-use system," he said.

Bonne defined multi-use as a system using multiple modes, including conversational time-sharing, computation, data entry, data base inquiry, batch processing and real-time.

The key factor is terminal orientation. "We find we are constantly expanding the terminal-oriented market. We think it is the way things are going in the future," Bonne said.

"Roughly 50% to 60% of the computers that we ship in the next five years will have terminal orientation and that involves machines in the \$550,000 to \$2 million category and above," he added.

"It is probably the largest single growing segment in the computer business in terms of annual shipments. Our market research tells us that the area is one of the greatest upside potentials," he noted.

Bonne said 50% of Xerox's business is in the multi-use or commercial business. Nearly all the Sigma 6 and Sigma 9 models are in multi-use environments.

Xerox's multi-use marketing effort is particularly strong in the education market, where its computers are used for administrative needs and academic requirements.

As an example, Bonne cited Carlton University in Ottawa, Canada, where two Sigma 9s have 64 time-sharing lines. The computers are also used for remote batch, local batch and transaction processing.

"The advantage to the school and students is that they have access to the computer at any time so they feel the computer is theirs," Bonne said.

"It's doing work for them any time they want to dial into the system. That eliminated a dedicated computer. The school is also doing the administrative work on the same computer."

"They can do all the necessary functions on one machine much cheaper than if they had to duplicate the capability at each locality to satisfy each of the needs," he said.

Low-Cost Recording Units Seen Reaching \$186 Million by '75

WELLESLEY, Mass. — Shipments of digital recording devices costing under \$1,000 are projected to reach \$186 million by 1975 and \$379 million by 1980, according to a study by Venture Development Corp. (VDC).

The study suggested that 1973 will be the year that the low-cost data recording industry's growth rate begins to accelerate, growing at a rate of 30% to 35%.

Although the market for units based on the Philips cassette will grow, it will lose some ground to cartridge recorders and to "mini-disk" recorders, the report said.

Minicomputer manufacturers "will continue to integrate vertically toward the end user and either develop their own lines of data recording peripherals or acquire cassette, cartridge and disk manufacturers," the study continued.

Similar multi-use systems are employed by Xerox in industrial environments such as McDonnell-Douglas Automation in St. Louis and at Western Electric in Atlanta.

Cohabitation With IBM

A multi-use system doesn't have to be exclusively Xerox, Bonne said. "We view the multi-use market as one where we would do all the work in a shop or where we could cohabit with IBM."

Software is not a major problem in setting up a multi-use system, he said.

"The challenge you have to address in a multi-use environment is the necessity of a rather sophisticated operating system capable of assigning priorities to system resources."

"Since you're not in a dedicated environment, the operating system has to be very sophisticated so it doesn't have a bias towards any one requirement. And if it doesn't handle the priorities right, you could have a real mess."

Foreign Orders & Installations

Eagle Star Insurance Group, United Kingdom, has ordered \$450,000 worth of 804 display terminals and 810 clustered terminals from Sanders Associates, to be installed in regional and branch offices throughout the UK.

Kooperativa Forbundet, a Swedish cooperative wholesalers' group, has installed a Tesdata System 1000 Model 1155 measurement system.

Radyne Ltd., British manufacturer of high-frequency industrial and scientific heating and welding equipment, has ordered an NCR Century 101 for use in an inventory management and control system.

Nationaal Lucht-en Ruimtevaartlaboratorium (NLR), the Netherlands National Aerospace Laboratory, has ordered hardware, software and services from Control Data Corp. valued at more than \$1 million. The contract includes the installation of a Cyber 70 Model 72 to replace a CDC 3300 system.

The Panama Canal Marine Bureau has installed an NCR Century 200 to help expedite ship passages through the canal.

British Leyland's Truck and Bus Division has installed two NCR Century 200s to handle production scheduling, purchasing control, and file maintenance. The twin computers are replacing two NCR 315s which had been in operation for nine years.

Integrit Databehandling A/s (IDA), Norway, has ordered a data communication system, including a C-8500 communication processor, from Collins Radio Co. The IDA system will be a nationwide network that will collect banking data and handle inquiry transactions.

Louis Cron Ltd., a Swiss investment company, has ordered an NCR Century 300 to serve as the nucleus of an on-line network linking the firm with its affiliated companies. The new system replaces a Century 100.

WE CALL THE 840 THE LOADED NOVA.

IT'S TOO BIG AND HAIRY TO BE A MINICOMPUTER.

By minicomputer standards, our new Nova'840 is big and hairy and costs a lot of money.

But, in terms of combined hardware/software performance, minicomputer standards just don't apply to the 840.

BIG HARDWARE

We loaded the 840 with a brand new Memory Management and Protection Unit that turns it into something far more than a minicomputer. MMPU lets the 840 grow to 128K 16-bit words (256K bytes) of main memory, and, most important, lets it take advantage of all the hairy software we've developed.

The 840 also comes with a whole list of peripherals and high-performance options, including a superfast new Floating Point Unit that handles single and double precision arithmetic at speeds that match most big computers.

HAIRY SOFTWARE

But hardware is only the vehicle. What makes the 840 a different kind of machine is software: the most powerful software available with any

computer at anywhere near its price. Proven software we can deliver today.

It has a Real-time Disc Operating System that supervises the whole system; our new Fortran 5, that produces globally optimized, fast-executing code that's as efficient as machine language; Batch; remote job entry software; timesharing BASIC; and Extended Algol.

Dual Operations on the 840 lets you run any two major software streams concurrently and with complete security: multi-terminal timesharing BASIC along with remote job entry, or a real-time control application while you're doing prototype development in Algol.

THE PROOF

With all that hardware/software muscle, the 840 has embarrassed a lot of far bigger computers in price/performance benchmark comparisons.

For instance, there was the XDS Sigma 7 that was 40% faster running an independently conducted Fortran

benchmark. And then got wiped out by the 840's more-than 10-to-1 price advantage.

Or the DECSYSTEM-1050 that cost eight times more than the 840. And was actually 7% slower running the benchmark.

If you think those benchmarks are too good to be true, just call us. We'd love the chance to give you a lot more details on the benchmarks and how Data General software makes that kind of price/performance possible.

THE PAYOFF

We know that Data General isn't the only minicomputer company with a big hairy machine.

We also know that the 840 is, capability-for-capability, feature-for-feature, consistently less expensive than the competition.

And we know we can deliver the 840 faster than the competition can deliver their machines: 90 days after you call us with an order. (617) 485-9100.

British Loan Aids ICL Development

LONDON — International Computers Ltd. has received a \$64.5 million grant from the government to aid in the development of its "New Range" of computers. The grant is in addition to a previous \$35.5 million extended in 1972.

Under the terms of the agreement, ICL will begin repayments during fiscal 1977-78 over a maximum period of seven years.

Estimates of R&D costs between 1971 and 1978 for ICL's New Range total about \$420 million, which makes the government's contribution about 25%.

ICL's plans indicate no further financial aid will be required of the government after 1976.

GEC and Plessey, each of which holds about 20% interest in ICL, have agreed to raise up to \$37.5 million "provided they are satisfied it will contribute toward ICL's development as a profitable company."

Need for European IBM Regulation Cited

LONDON — One of the primary concerns of the European Economic Community should be the regulation of the manner in which IBM operations develop in Europe, according to Alex d'Agapeyeff, chairman of Computer Analysts and Programmers.

Policies should be based on a realization of the reasons for IBM's power, and should be uniformly applied throughout the EEC, he told attendees at a recent conference.

Efforts should be made to ensure that the controlling measures do not reduce the quality of European computing, he emphasized.

Great Britain

Looking at the DP industry in Great Britain, he cited the need for a statement by the government on its intentions toward ICL and the entire UK industry.

He urged government support of the growth of software houses. A software house of comparable size to a large inter-

national accounting firm would aid in controlling "the IBM dragon," he said.

The profitability of software firms is presently very low, he said, noting this situation could lead to large-scale American competition if not remedied.

D'Agapeyeff urged that representatives of government and large DP companies formulate a plan concerning the policy of government intervention in the industry.

He noted that many DP achievements had been made with imported hardware

and software, and that emphasis is currently being placed on the development of complex systems, when he is sure the eventual trend will be to simpler and less expensive microcomputers.

Europe is neglecting the telecommunications area, and could find itself overtaken by "underdeveloped" countries that could quickly install newer and more reliable methods of communication if it continues its practice of investment in maintaining outdated transmission systems.

ECMA Issues New Disk Standards

GENEVA, Switzerland — The European Computer Manufacturers Association (ECMA) has issued a new series of standards for disks, as well as updated versions of previously published standards, which take into account field experience since the previous issues.

New standards are available for Me-

chanical, Physical and Magnetic Characteristics of Interchangeable Single Disk Cartridges (ECMA-38) and for Track Format Characteristics of Interchangeable Single Disk Cartridges (ECMA-39).

Standards being reissued are 7-Bit Input/Output Coded Character Set (ECMA-6), Magnetic Tape Labeling and File Structure for Information Interchange (ECMA-13), Basic Mode Control Procedures for Data Communication Systems using the ECMA 7-Bit Code (ECMA-16), and Data Interchange on 3.81 mm Magnetic Tape Cassette (32 bppm, Phase-Encoded) (ECMA-34).

Free copies of these standards as well as of other ECMA standards are available upon request from ECMA, 114 Rue du Rhone, 1204 Geneva.

Aussie Treasury Orders 370 For Accounting Systems

Special to Computerworld

CANBERRA, Australia — The Federal Government here has decided to buy an IBM 370/158 for \$3.4 million.

The 370 will take over a job now being done on Control Data equipment.

When fully developed the new installation will process Treasury Department's accounting systems in Canberra, and all states and territories, which are now processed on CDC computers operated by the Bureau of Census and Statistics.

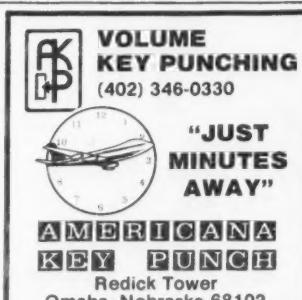
The treasurer, Frank Crean, said the system will form a central computing installation within the Treasury building.

Basic/Four Sets Dealerships

SANTA ANA, Calif. — Basic/Four Corp. is establishing a dealership network in a move toward marketing its equipment on a nationwide basis.

Basic/Four presently markets its systems directly in Los Angeles, San Diego, New York City, Springfield, N.J., Chicago, Boston and Long Island.

The company will contract dealerships to market its product in other major cities.



DATA GENERAL
Southboro, Massachusetts 01772

CASH PAID for TELETYPE®

PLUS ALL ACCESSORIES

NEW OR USED

CALL (214) 252-7502

TWX-910-860-5761

OR WRITE

Vardon & Associates, Inc.
930 N. Beltline, Suite 140
Irving, Texas 75062



The Digi-Log Interactive Video Terminals add a new, silent dimension to file inquiry systems.

Like **Magic**, these silent windows into your files quickly and quietly present a record for viewing or verification by the operator, customer, client, or patient.

Like **Magic**, inquiries can be made for account status . . . sales by region . . . credit . . . personnel records . . . or reservations, and output is provided without the fuss and waste of unnecessary printouts.

The Digi-Log terminals are teletype and TV compatible and,

Like **Magic**, cost less than \$1,000 in quantity.

For **your** magic of video inquiry call now for immediate attention, 215 659-5400.

**DIGI - LOG
SYSTEMS, INC.**
666 Davisville Road
Willow Grove, Pa. 19090

For Six Months

Boothe Loses \$1.9 Million

SAN FRANCISCO — Boothe Computer Corp. reported a six-month loss of \$1.9 million for the six months ended June 30.

In the 1972 period, for which figures are not adjusted to reflect a later one-time \$36.5 million depreciation charge, the firm earned \$1.2 million or 57 cents a share, of which \$1.1 million or 53 cents came from extraordinary gains from sales of stock of subsidiaries.

Revenues Decline

Revenues for the half year fell to \$24.6 million from \$30.2 million.

Dearborn Changes 360 Depreciation

CHICAGO — Dearborn-Storm Corp. has changed its depreciation policy for its portfolio of 360s, which, after deferred tax reversals of \$5.2 million, will reduce 1973 earnings by \$4.9 million or about \$1.80 a share.

The company has provided additional depreciation, primarily for certain peripheral equipment; revised the estimated residual value of its portfolio from 10% to 4% of original cost, and adopted the break-even policy of providing depreciation at the same rate that each period's anticipated revenues bear to total projected revenues through Oct. 31, 1978.

"Our computer leasing business has been holding up well relative to our competition," a spokesman said. "However, recently there has been increased speculation about the likelihood of radi-

cal new product announcements by IBM within the next two years and other risks related to the future marketability of Model 360 computers."

Pitney Bowes-Alpex Shows Quarter Loss

DANBURY, Conn. — As anticipated by the firm, Pitney Bowes-Alpex, Inc. continued to show a loss for the quarter ended June 30, with a loss of \$3.2 million on revenues of \$5.1 million. The firm shipped more than \$2 million worth of equipment in June, and to date has shipped 6,000 registers to more than 300 stores in the U.S. and Canada, a spokesman said.

As of June 30, order backlog stood at about \$22 million of which about \$15 million were firm and about \$7 million options on firm orders.

The Computer Users' Forum and Exposition, English-style

You're invited to see the latest EDP equipment and services during our Computer Caravan tour of the United Kingdom in September.



The European Computer Caravans
sponsored by
COMPUTERWORLD
and Computer Management

We extend a hearty invitation to our English and European readers to visit the English Computer Caravan during September. You'll find the user-oriented forums and workshops to be of immediate, practical use—and you'll see the latest EDP equipment and services at our exposition.

Here's the schedule:

City	Dates	Location
Manchester	Sept. 3-5	New Century Hall
Birmingham	Sept. 11-13	Great Hall, University of Birmingham
Edinburgh	Sept. 18-20	MacRobert Pavilion
London	Sept. 25-27	Europa Hotel

Advance registration is not necessary for the exposition, but is advisable for forum attendees. If you'd like further information, contact:

**CARAVAN REGISTRATION
c/o COMPUTER MANAGEMENT
196 SHAFESBURY AVE.
LONDON, WC2H 8JL
UNITED KINGDOM
TELEPHONE: 012401024**

Ball Finances Tally, Names 4 to Board

KENT, Wash. — Ball Corp. has agreed to provide Tally Corp. with \$1.5 million in financing, and has placed four men on the firm's eight-man board of directors.

Richard M. Ringoen, vice-president and general manager of Ball Brothers Research Corp., a subsidiary, has been elected chief executive officer and chairman of the executive committee.

James E. Navarre remains as president.

The National Bank of Commerce of Seattle has extended for one year its existing \$750,000 line of credit.

For the second quarter Navarre said the company could have met its operating plan and reported a profit if it could have avoided work stoppages and inefficiencies resulting from the inability, because of cash limitations, to establish a satisfactory flow of parts from its suppliers.

In addition, Tally Leasing Co. suspended its lease financing agreement, which resulted in reduced revenues and placed increased cash flow burdens on the company, he said.

The second quarter loss was less than that of a year ago; however, in the six months the deficit grew.

For the three months, the firm had an operating loss of \$169,328 compared with \$208,120 for the

year-ago quarter, despite declining revenues, which fell to \$2.8 million from \$3.4 million.

A loss of \$111,261 from the sale of its EDP Division was also reported for the quarter.

In the six months, Tally's operating loss was \$504,503, compared with \$430,142 during the same 1972 period. Revenues totaled \$5.9 million compared with \$6.2 million.

The backlog of released orders totaled \$6.4 million July 29, compared with \$2.3 million at the beginning of the year, Navarre said.

Terms of the agreement call for Ball to provide Tally with up to \$1.5 million of collateralized credit in the form of demand notes at interest rates approximating Ball's cost.

In return, Ball received about 1.6 million warrants for Tally stock, exercisable at \$3 per share within five years. The warrants represent all of its authorized but unissued and unreserved common shares, Tally said.

Under the terms of the agreement, Ball will relinquish these warrants in the event it withdraws its loan before Tally is able to establish its own line of credit.

Ball Brothers Research Corp.'s products include computer subassemblies and data display devices.

S/370 155 and 155 II WALKAWAY LEASES

Also for Sale or Lease

IBM New 370/158 or 168 CPU

IBM 3360 Model 3 Processor Storage

October Installation

1 Megabyte Memory and Console

Monthly Lease Rates

	2-yr Lease	3-yr Lease
Model 155	\$23,750	\$21,950
Model 155-II (VS)	\$28,500	\$26,450

Call or Write: Commonwealth Computer Advisers, Inc.
106 N. Eighth Street
Richmond, Virginia 23219
(804) 643-9123

DP Services Firm Uses 'Unobtrusive' Approach

By Marion Rubinstein

Special to Computerworld

HOUSTON — To provide total service to hospital administration on a personalized basis, Medical Dimensions, Inc. "constantly strives to keep the computers, peripheral equipment, terminal devices, communications network and any other tangible devices that are utilized as completely in the background as is possible," observed President O.B. Frasier.

"All of these items are considered simply tools of the trade and should remain as transparent and unobtrusive as possible. Our total emphasis is on producing the highest quality and most dependable results possible, within a completely justified cost range."

"We do not consider that there is a market of 8,000 plus hospitals for a system. It is our opinion that there are 8,000 plus individual markets for personalized administrative services."

The company has grown since its first hospital client in 1965 to a list of over 100 hospitals in 10 states. "In the last three years, since the company was incorporated under the name of Medical Dimensions, the client base has expanded over 1,200%," Frasier said.

"In instances where hospitals have attempted to provide computer facilities to fulfill all of their individual requirements, the Medical Dimensions approach will actually allow a reduction in costs due to the capability of spreading the burden of extremely costly fixed expenses among Medical Dimensions' wide client base," he said.

Expansions

Inforex, Inc. has started construction of a 130,000-sq-ft manufacturing and warehousing facility adjacent to the company's headquarters in the Northwest Industrial Park, Burlington, Mass.

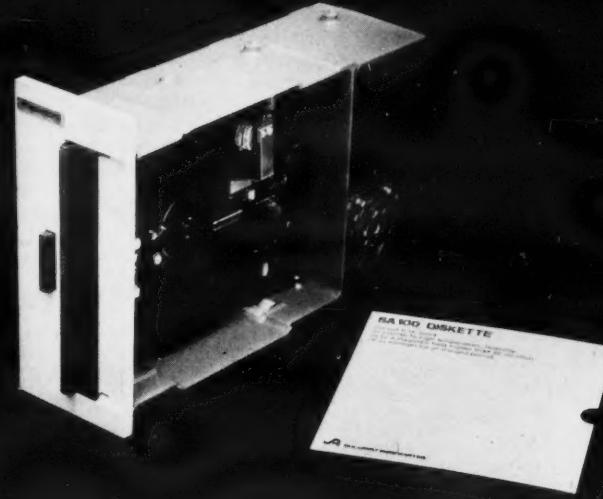
Hewlett-Packard Co. will begin construction by late 1974 of a plant in Boise, Idaho, which will be occupied by part of the company's Data Systems Division, headquartered in Cupertino, Calif.

Univac has leased 17,500-sq-ft at 6700 West Loop South, Houston, to provide better marketing and educational programs for prospective customers.

Graham Magnetics, Inc. has contracted for a 47,556-sq-ft plant addition to its Graham, Texas, facilities, to provide manufacturing capacity for new products and for expansion of current production.

Interdata, Inc. has opened a sales/service office for Missouri, Kansas and Nebraska.

Good for your system.



The SA900 Diskette Storage Drive

Shugart Associates, a new corporation located in Sunnyvale, California, has delivered its first product, the SA900 Diskette Storage Drive.

The company, founded in February, 1973 by an experienced group of engineering and marketing professionals, has recently started manufacturing in a new 31,500 square foot facility where they are producing the SA900/901 Diskette Storage Drives.

The SA900 is designed to use the IBM Diskette or any media that is compatible with the IBM Diskette. It is also logically and full format compatible with the IBM Diskette. In other words, a Diskette used on an SA900 Diskette Storage Drive is completely interchangeable with Diskettes used on the IBM 3740 System.

The SA900 is a low cost media handler with high reliability characteristics enabling both random and sequential access to data.

For further information, contact our corporate headquarters in Sunnyvale or our European representative at the following locations:

ITC Europa
Place des Moulins
Monte Carlo, Monaco
Tel. (93) 304406
Telex 46820

ITC Systems Ltd.
Victoria Road
Feltham, Middlesex
TW 13 7DR, England
Tel. 01 751.1173
Telex 935373

ITC Deutschland GmbH
Arminstrasse 15
7 Stuttgart, West Germany
Tel. (0711) 64.65.86
Telex 722891

ITC France
Batiment Berne
3, Rue Le Corbusier
94 Ruwagis
Tel. 686.1585
Telex 20324

Shugart Associates is represented in Europe by the International Trading Corporation and they will exhibit the SA900 at the SICOB Show in Paris, September 18-24.

SHUGART
ASSOCIATES

335 Soquel Way,
Sunnyvale, California
94086
(408) 738-2524

TWX 910 339 9355 SHUGART SUVL



Investigators Still Seek PGI 'Fire File'

Special to Computerworld
CHERRY HILL, N.J. — Investigators looking into the affairs of the now-closed Peripherals General, Inc. (PGI) have so far failed to locate the "fire file" which contains all the firm's most valuable drawings and plans on microfilm.

The file, normally kept in a fireproof vault, was apparently not found when inventories of the contents of the building were taken.

However, a number of places have not been searched yet and the file may still be found, officials said. Neil Peterman, the former president of PGI, told *Computerworld* the file was on the premises.

Sources close to the investigation indicate the file would permit an organization to duplicate all the work put into the PGI Universal Controller and PGI's IBM and GE replacement disk drives and systems. This work was regarded as a major asset of the corporation.

The question of why the firm closed down without making any legal provision for the reorganization of the business and its continuation was raised by a number of shareholders, led by former President James Linnell.

Linnell, who was ousted as president last April, said his own state petition for trusteeship had at least served to protect the interest of stockholders, but that it had now been superseded by a Chapter 10 petition from creditors in the federal court.

A Chapter 10 petition is for involuntary bankruptcy, as opposed to a Chapter 11 for voluntary bankruptcy.

Linnell said he is forming a shareholders committee to see that their rights are protected as much as possible.

The next step in the proceedings will be up to Stanton D. Freeman, the court-appointed receiver, who will hold the first public hearing in the case. The date for the hearing has not yet been scheduled. Kleinberg,

Maroney, Masterson and Schacter of Newark, N.J., will represent PGI.

Unexplained Happenings

The absence of the "fire file" is actually the third unexplained circumstance since the firm quietly closed its doors in July. Other cases were:

- The removal of \$500,000 worth of inventory from the premises by the First National City Bank of New York after a restraining order had been granted forbidding the removal of anything from the premises

"I resigned from PGI as vice-president in June, but they persuaded me to take over the presidency from Carl Fisher. Now I am stuck with this whole mess," commented Neil Peterman, the last president of PGI, as he spoke about PGI's troubles and answered various questions raised by the company's recent closing.

The reason why the inventory, valued at \$500,000, had not been used to fill the \$1.7 million backlog was because of the ownership of the inventory, he said. The inventory was owned by First National City Bank, a secured creditor, and as a result, the unsecured trade creditors amounting to \$800,000 were not prepared to advance the trade work needed to put the inventory in shape for customer shipment, Peterman explained.

Peterman said no petition for reorganization was presented under Chapter 11 because there was "no interest" in such a reorganization. "The only investor that would put money in was Prudential. They refused to refinance us until we had reached a settlement with all our creditors," he said.

Apparently, the creditors refused to settle, and were pressing for receivership, so the firm closed its doors. Currently they are trying to arrange for an assignment of assets.

[CW, Aug. 15].

- The apparent failure of the firm to deliver goods it had in stock against a reported \$1.7 million backlog.

Former employees indicated sales of \$500,000 worth of GE replacement equipment had been made, but that deliveries had not taken place.

They said the \$500,000 inventory was 95% complete, and that only \$30,000 worth of easily obtainable parts had been needed since April to ship the goods, thereby avoiding the financial crisis.

PGI President Explains the 'Mess'

The backlog figures reported are "phony" he said, because they include many contingent contracts for disk drives.

The decision in principle to cease manufacturing disk drives was made in May [CW, Aug. 15], Peterman explained, because PGI found it could buy disk drives cheaper than it was making them.

The removal of the inventory after the restraining order had been served occurred while the building was posted with notices of the order. Peterman said the inventory belonged to First National City Bank, and that he had operated under attorney's instructions.

Peterman blamed the firm's crash on managerial failures. "The board of directors was misled by the presentations they were given, which glossed over the real difficulties. As a result there was too much exposure involved for us to find new investors when the real situation became known."

Peterman, who had been a director, said he had not brought the difficulties up at the board meetings.

"It's very difficult to bring difficulties up when you are an insider," he commented. When the vice-president of finance, Eugene Garen, mentioned difficulties he was fired, Peterman said.

Earnings Reports

GREYHOUND COMPUTER

Three Months Ended June 30

	1973	1972
Shr Ernd	\$.14	\$.24
Revenue	10,779,000	b11,779,000
Earnings	607,000	1,039,000
6 Mo Shr	.29	.50
Revenue	21,345,000	b23,897,000
Earnings	1,248,000	2,179,000

a-Includes results of Bresnahan Computer Corp. acquired June 1, 1973. b-Restated to reflect full consolidation of wholly-owned foreign subsidiaries.

WAVETEK

Three Months Ended April 14

	1973	1972
Shr Ernd	\$.15	\$.05
Revenue	1,991,400	1,185,930
Earnings	128,904	36,653
6 Mo Shr	.33	.20
Revenue	4,264,053	2,900,949
Earnings	284,645	150,836

a-Gain from foreign exchange adjustments; in the nine months also includes gain from sale of surplus plant.

DIGI-LOG SYSTEMS

Three Months Ended March 31

	1973	1972
Revenue	\$212,400	\$52,438
Loss	118,226	48,090
6 Mo Rev	384,312	111,536
Loss	165,714	84,761

DATA PRODUCTS

Three Months Ended June 30

	1973	1972
Shr Ernd	\$.25	\$.05
Revenue	18,877,000	13,927,000
Tax Cred	819,000	163,000
Earnings	1,714,000	349,000

APPLIED DATA RESEARCH

Six Months Ended June 30

	1973	1972
Shr Ernd	\$.12	\$.10
Revenue	5,089,129	4,425,831
Earnings	136,527	94,103

a-Restated.

SANGAMO ELECTRIC

Six Months Ended June 30

	1973	1972
Shr Ernd	\$.83	\$.67
Revenue	47,827,000	42,391,000
Earnings	2,235,000	1,821,000

CODEX

Three Months Ended June 30

	1973	1972
Shr Ernd	\$.38	\$.21
Revenue	2,149,000	1,288,000
Tax Cred	257,000	124,000
Earnings	548,000	277,000
9 Mo Shr	.96	.15
Revenue	5,222,000	2,692,000
Tax Cred	654,000	90,000
Earnings	1,377,000	194,000

CENTRONICS DATA COMPUTER

Year Ended June 30

	1973	1972
Shr Ernd	\$ 1.01	\$.31
Revenue	24,027,000	6,723,000
Tax Cred	630,000
Earnings	4,880,000	1,490,000
3 Mo Shr	.36	.13
Revenue	8,114,000	2,728,000
Tax Cred	278,000
Earnings	1,730,000	621,000

TEXAS INSTRUMENTS

Three Months Ended June 30

	1973	1972
Shr Ernd	\$.90	\$.54
Revenue	316,382,000	236,355,000
Earnings	20,391,000	11,844,000

6 Mo Shr

	1973	1972
Shr Ernd	1.73	a1.02
Revenue	605,390,000	452,117,000
Earnings	39,255,000	22,621,000

a-Adjusted to reflect two-for-one stock split effective April 30, 1973.

LOGICON

Three Months Ended June 30

	1973	1972
Shr Ernd	\$.08	\$.15
Revenue	3,887,029	3,042,647
Earnings	70,983	130,367

MILGO ELECTRONIC

Three Months Ended June 30

	1973	1972
Shr Ernd	\$.51	\$.36
Revenue	5,518,000	3,480,000
Earnings	807,000	571,000

9 Mo Shr

	1973	1972
Shr Ernd	1.44	.89
Revenue	15,621,000	8,944,000
Earnings	2,298,000	1,422,000

COMPUTER DESIGN

Three Months Ended June 30

	1973	1972
Shr Ernd	\$.20
Revenue	7,172,705	\$ 2,452,339
Earnings	333,835	(366,943)

6 Mo Shr

	1973	1972
Shr Ernd	.31
Revenue	12,886,807	6,766,627
Earnings	519,597	(241,995)

a-Restated to reflect year-end adjustments.

GRANITE MANAGEMENT

Three Months Ended May 31

	1973	1972
Shr Ernd	\$.02	(\$.08)
Revenue	6,307,000	8,072,000
Tax Cred	25,000
Earnings	52,000	(229,000)

Position Announcements

SYSTEMS PROGRAMMERS

Northern New Jersey

Excellent career opportunities exist for individuals with IBM background, knowledge of OS (MFT, MVT, and/or VS-1 and/or VS-2) and/or HASP, systems generation, performance, measurement and tuning also desirable. Knowledge of Assembler language essential. We are the fastest growing company in Remote Access Computer Service and offer a tremendous atmosphere for professional growth and development. The comprehensive compensation package includes totally company paid benefits and rewards for outstanding performance.

To explore these unique opportunities please rush your resume indicating salary history in strict confidence to:

Personnel Manager
P.O. Box 1025
West Caldwell, N.J. 07006
An Equal Opportunity Employer M/F

AGENTS WANTED

We need sales representation in several locations in the U.S.A., Canada and Mexico by agents who are willing to guarantee results. Two of our major software products, WORK TEN, a COBOL generative language and RSVP, a user oriented report retrieval system, are presently installed in over 150 locations world-wide. Plenty of excellent references available. Send qualifications and requests for information to:

Frank U. Beck
NCI, Inc.
6075 Roswell Road
Atlanta, Georgia 30328

THE VIEW IS GREAT

San Francisco Bay — that's where we're located. Our offices have a great view of the Bay. With a golf course on the other side. That's a big view either way.

And there's a big view inside too. We're a medium-sized insurance company with an ambitious view toward growth. And your role as a programmer/analyst here gives you a big view of the company's entire operation. You are more than just a piece of the system — you are a valuable and recognized contributor to our growth.

If you'd like to set your sights on a bigger view, we'd like to talk with you. We are actively seeking two programmer analysts with insurance applications experience, 360 exposure and a solid foundation in COBOL. To apply for these openings, send your detailed resume with salary history to:

John C. Ross
CALIFORNIA CASUALTY MANAGEMENT CO.
P.O. Box M
San Mateo, Calif. 94402

SYSTEMS ANALYST

Growing company has excellent opportunity for individual with degree in engineering, mathematics or equivalent experience to work on state of the art interactive design drafting system.

Successful candidate will have experience in machine language and higher level language on digital scientific computers. Background in data base design, computer graphics or time shared operating systems an asset.

Excellent starting salary, ideal professional environment and full fringe benefit program.

To arrange confidential interview send resume to Watson Peterson, Jr., Director of Personnel

Gerber Scientific
Instrument Company
83 Gerber Road, South Windsor, Conn. 06074
An Equal Opportunity Employer

Computerworld Sales Offices

Vice President-Sales: Neal Wilder. Sales Administrator: Dottie Travis. Computerworld, 797 Washington St., Newton, Mass. 02160. Tel: (617) 332-5606.

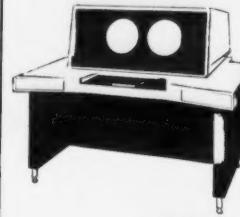
Northern Regional Manager: Robert Ziegel. Account Manager: Mike Burman.

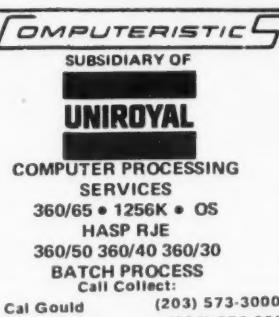
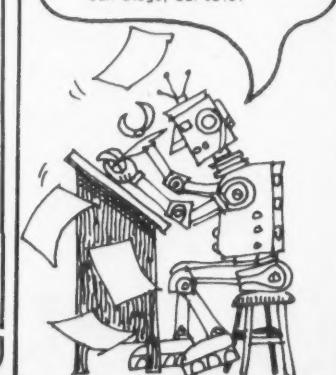
POSITION ANNOUNCEMENTS	POSITION ANNOUNCEMENTS	POSITION ANNOUNCEMENTS	POSITION ANNOUNCEMENTS	POSITION ANNOUNCEMENTS
<p>Unique need for EXPERIENCED 360/370 COBOL PROGRAMMER in Northeast Mississippi. Applicant should also be experienced in AUTOCODER 1400. We have immediate need for Autocoder program maintenance in interim period prior to full conversion (to native language) currently in process. Public utility experience helpful, not essential. Multiple System 370 installation teleprocessing system. Excellent growth potential and exceptional fringe benefits.</p> <p>Resume to General Manager P.O. Box 348 Tupelo, Miss. 38801 or call (601) 842-5962</p>	<p>COMPUTER HARDWARE MANAGER</p> <p>We presently have need for a new Computer Hardware Manager within our expanding Wall Street Data Center. Individual selected will work with the latest in computer technology, i.e. twin IBM 370/155's under OS/MVT. We also are presently implementing an on-line teleprocessing system.</p> <p>Will supervise the evaluation and selection of new computer equipment and maintenance services for the continued development of our growing systems while dealing with various vendors. Will also be responsible for investigating existing hardware monitoring devices to help in this task and to improve overall configuration cost effectiveness. Desire 2-5 years related experience with thorough knowledge of compatible equipment for the IBM 370 system. Salary range \$17,000 to \$18,500.</p> <p>Please send resume including salary requirements to: Director, Hardware & Communications, P.O. Box 95, Bowling Green Station, N.Y., N.Y. 10004</p> <p>An Equal Opportunity Employer M/F</p>	<p>DP MARKETING MANAGER</p> <p>Nationally known Corporation is seeking an experienced individual to assume responsibility for Data Processing Marketing Function. Assignment would include complete responsibility for marketing, planning and executive of DP Packages. Successful candidate will have a degree in Marketing or Business Administration with a minimum of 4 years in DP Software Package Sales and including some supervisory responsibility. Financial or health care background desirable. Send resume and salary listing to:</p> <p>CW Box 3910 797 Washington Street Newton, Mass. 02160 An Equal Opportunity Employer M/F</p>	<p>D.P. MARKETING REPRESENTATIVE</p> <p>Large computer leasing company expanding its activities in the sale of pre-owned equipment needs experienced marketing type. Send your resume in confidence to:</p> <p>CW Box 3900 797 Washington Street Newton, Mass. 02160</p>	<p>CONTROLLER AND DATA PROCESSING MANAGER</p> <p>Dynamic company has unusual opening for "people-oriented" manager. This person will head accounting and data processing sections as well as do programming. Our IBM System 3 data processing is highly innovative. We also have rapidly growing computer service bureau for other area firms. Accounting and extensive data processing a must. Delightful small town living, excellent working conditions, many fringe benefits. Salary \$16,000 per year. This is an excellent opportunity.</p> <p>Write: Personnel Manager Liberty Petroleum Co., Inc. P.O. Box 1209 Mt. Vernon, Illinois 62864 All inquiries will be kept confidential.</p>
<p>PROGRAMMER ANALYSTS</p> <p>Challenging new positions for experienced individuals to further apply their programming skills. Responsibility will be for production applications such as production and inventory control and cost systems. We have a 370/135 DOS and prefer related manufacturing experience.</p> <p>These positions are due to continued growth of our expanding company. We offer top compensation and excellent benefits including paid insurance. Call or send resume: Personnel Supervisor, PANDUIT CORP., 17301 Ridgeland Avenue, Tinley Park, Illinois 60477. (312) 532-1800.</p> <p>PANDUIT CORP.</p> <p>An Equal Opportunity Employer</p>	<p>SYSTEMS PROGRAMMER - STATE OF WISCONSIN</p> <p>Wisconsin Civil Service Classification: Management Information Specialist 4 - Software Programmer. One vacancy with the Department of Industry, Labor and Human Relations/Systems and Data Processing, Madison, Wisconsin. JOB DESCRIPTION: Systems programmer for an IBM S/370 155 under O/S - HASP. QUALIFICATIONS: Three years of progressively responsible experience in various professional data processing or management information activities, including one year of systems programming and/or assembler language experience. SALARY: Starting salary between \$1082-\$1217 per month. Excellent fringe benefits. Send resume to: Dennis H. Janis, DILHR Personnel, P.O. Box 2209, Madison, Wisconsin 53701 or call me at (608) 266-1074. Apply by September 13, 1973.</p> <p>AN EQUAL OPPORTUNITY EMPLOYER FUNCTIONING UNDER AN AFFIRMATIVE ACTION PLAN</p>	<p>EDP PROFESSIONALS</p> <p>NO YES</p> <p>We are not in the market for EDP professionals who wish to remain technicians. If you desire a staff position, please do not respond. We do not consider those who are unwilling or unable to sell their problem-solving skills.</p> <p>We would like to hear from you if you:</p> <ul style="list-style-type: none"> • Are a systems analyst with 2-5 years experience. • Have a solid applications and programming experience. • Desire to manage and sell. • Would like to be rewarded commensurately with your performance. • Have a degree. <p>If your interests and qualifications match our requirements we would like very much to talk with you about a challenging and rewarding career with the Chicago office of a highly regarded national consulting firm.</p> <p>Please send your resume with salary history in confidence to:</p> <p>CW Box 3913 797 Washington Street Newton, Mass. 02160 An equal opportunity employer</p>	<p>MANAGER CUSTOMER SUPPORT SERVICES</p> <p>Large Indiana Health Care Organization offers a challenging career opportunity for experienced individual to manage customer applications, installation and maintenance support. Responsible for post sales installation of systems and applications, modify software specifications to meet new customer requirements, instruct customers in the use of newly installed systems and provide effective customer support services to meet all problems and complaints. Successful candidates will have a degree with a minimum of four years experience in System and Programming, knowledge of Accounting principles, and management experience. Familiarity with EDP Sales and Customer orientation highly desirable. For prompt consideration, please forward resume and salary history to</p> <p>CW Box 3911 797 Washington Street Newton, Mass. 02160 An Equal Opportunity Employer M/F</p>	<p>PROGRAMMER / ANALYSTS</p> <p>We are currently involved in some of the most exciting projects a professional programmer could seek.</p> <p>A.G. Becker is a prominent investment banking firm whose Chicago offices are in the First National Plaza. Our Funds Evaluation Division is developing a new financial application which requires expanding our programming staff to include another well experienced scientific programmer.</p> <p>We need a talented person with the following qualifications:</p> <p>2-3 years programming experience on the 360/370 series OS background Fortran and/or PL-1 language required Strong academic preparation (M.S. preferred)</p> <p>Salary is commensurate with experience. Our excellent benefits include a unique profit sharing program.</p> <p>To confidentially discuss these projects and your professional background, send letter or resume, with salary history to Mr. Arthur Miller.</p> <p>First National Plaza, Chicago, Ill. 60670</p> <p>A.G. Becker & Co. INCORPORATED</p> <p>An Equal Opportunity Employer</p>
<p>COMPUTER SCIENCES OF AUSTRALIA PTY. LIMITED</p> <p>460 Pacific Highway, St. Leonards, 2065, N.S.W., Australia.</p>	<p>Buy Sell Swap</p> <p>IFA</p> <p>IFA FOR SALE IBM INTEGRATED FILE ADAPTER IBM Feature 4650 Cost New \$28,320 *Replaces Channels 1+4 on 370/145 *Replaces 2314 Control Unit *Supports up to Eight IBM 2314 Spindles Available November 1973 Any Reasonable Offer Will be Considered</p> <p>OTIS ELEVATOR CO. 30 Glenn Street White Plains, N.Y. 10603 Attn: P. Cobin (914) 428-5800</p>			

BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP
FOR SALE IBM EQUIPMENT 085, 407, 514, 519ms, 548, 557, 632 1460 W1 1403 Mod 3 UNIVAC EQUIPMENT 1004, 9200, 9300, Fastrand Drums SPECIAL 9200 24K Disc System WANTED IBM 360-30, all types Univac Contact: Unit Record Service Co. 84 Cummings Park Woburn, Mass. 01801 Tel. (617) 935-6340	FOR SALE NCR CENTURY DISC PACKS 955-1 NCR CENTURY CRAM DECKS -5 (2) NCR 735-101 TAPE ENCODERS (219) 747-1502	FOR SALE NCR C-616 Short Rod Memory System (16K x 9 Bit) Priced for quick delivery	WE WANT TO BUY Used Burroughs TC-500 Terminals • any quantity up to 300 • must be covered by Burroughs Maintenance If you want top price by selling directly to end user, forward detailed specs, availability date and price to: CW Box No. 3908 797 Washington Street Newton, Mass. 02160	L E I SPECIALISTS IN 370 CORE 3360/003 3360/005 Leasing Dynamics Inc. 3101 Euclid Ave. Cleveland, Ohio 216-687-0100 BUY • SELL TRADE • LEASE ANY EDP EQUIPMENT
FOR SALE BY OWNER IBM 3830/3330, 8 DRIVES SEPT. 15 DELIVERY L.H. WILLIAMS 919-549-8291	FOR SALE Hewlett - Packard 2 - 2870 A Disc Drives 1 - 2871 A Controller 1 - 12557A Interface Card 1 - 2881 A Power Supply 1 - 2882 A Cabinet Used on H-P 2000C Time Share System Cliff Doyle General Time Share, Inc. 3529 Seventh Avenue, South Birmingham, Alabama 35222 (205) 252-9441	FOR SALE QUELEX DATA SYSTEMS, INC. 8740 Shirley Ave. Northridge, CA 91324 (213) 349-9711 TWX: Qualex Ntge (910) 493-1243	WE WILL PURCHASE THE FOLLOWING MACHINES: 024-026-029 Key Punches 082-083-084 Sorters 548-552-557 Interpreters 087-088-188 Collators 402 and 519 CONTACT VAN PERKINS CIMARRON EQUIPMENT LEASING COMPANY 711 THURSTON NATIONAL BUILDING TULSA, OKLAHOMA 74103 (918) 584-0073	we buy and sell IBM Computer Systems & Unit Record Machines NCR 31-32-33-395-400 Burroughs - L Series marion 84 Kennedy St. Hackensack, N.J. 07601 (201) 343-4554
Available Immediately Honeywell 120-CP 16K 4 tapes printer, reader 7-ton air conditioner Excellent Condition For Details Phone (904) 358-4040	FOR SALE 128K Unit Of IBM CORE for 360 model 40 Call or Write Programming Manager P.O. Box 44 Wall Street Station New York, N.Y. 10005 (212) 285-2992	Don Bell - Vice President Bothe Computer Corp. 555 California St. San Francisco, Calif. 94104 (415) 989-6580	WE WANT TO BUY Teletype® Model's 28-33-35 Modems - Couplers - Other Data Communication Equipment WE ALSO SELL THE ABOVE Call or Write: DATA COMMUNICATION EQUIPMENT BROKERS, INC. 1900 Thunderbird Street Troy, Michigan 48084 (313) 689-2640	Before you Buy -Lease -Sell- 360-370-1401- All Type IBM Unit Record Equipment Please Call or Write COMPUTER CLEARING CORP. 2600 Arroyo, Suite 124 Dallas, Texas 75219 Telephone (214) 528-5087 "We guarantee delivery at a fair market price." -George Jachimiec, President
1400-360 Specialists in 1401, 1440 360/20, 360/30 Hundreds of Satisfied Users Free Appraisal Service BUY-TRADE SELL-LEASE Call us last- but Call Us! C M C O R P. Area Code 313- 889-0440 16225 E. Warren Avenue Detroit, Mich. 48224	SURPLUS 100 TAPE DRIVES \$1500 EA. Units are Ampex TM-7 Read Only. Complete in desk height type cabinet. Various quantities of NRZ and PE configurations. Units sold as is - F.O.B. warehouse. CW Box 3907 797 Washington St. Newton, Mass. 02160	FOR LEASE BY OWNER 2030 F.0 MIC 65K 1403 N-1 1416 HN 1442 C/R/P 2841 2821-1 Available October 1, 1973 Excellent Terms Available Don't Pass This One Up Principals Only Contact: CITIZENS FINANCIAL CORPORATION (216) 692-1800 Mr. John Hall	Equipment for Sale Immediate Delivery New - Like New Models 33, 35, 28 & 32 Call (609) 779-4129	BUY SELL LEASE 1410 7074 729's 360/50, 512K, Late 73 Honeywell 200 System Immediate Systems and Components Also Teletypes & CRT's EBM 220 HARVEST AVE. STATEN IS., N.Y. 10310 (212) 273-3636
IBM 1401 SYSTEMS 4K CARD (C3) \$14,500 12K CARD (C5) \$21,000 12K 4 TAPE (C5) \$33,500 Call: (617) 261-1100 We BUY Any Computer Peripheral or Teletype Send for FREE Price List AMERICAN USED COMPUTER CORPORATION P.O. Box 68, Kenmore Station, Boston, Ma. 02215	DATACASE TAPE STORAGE RACKS Double 560 Tapes \$175.00 Seals Thick or Thin 29M Single 280 Tapes \$105.00 19M Wright Line Tape Racks Tape Racks For \$50.00 7M 120 Seals Tape Seals - Used Wright Line 2400 \$.75 16M and 1200 Ft. - White Canisters - 2400 Foot Thinline - Used \$.75 30M 2400 Foot Reels - 2400 Foot Like New \$.75 15M Aluminum Hubs Good But With \$.50 6M Labels Call Collect Tomm Ross (713) 772-5557 Computer Accessories Research Diversified 7575 Bellaire Houston, Texas 77036	AVAILABLE IMMEDIATELY 900 1316-00 Disk Packs "As Is" Condition \$20.00 Each FOB Worcester, Mass. Will Sell in any Quantities (ORDER TODAY) Send Order To: H.T.H. Post Office Box 365 Worcester, Mass. 01613	FOR SALE OR LEASE 360/30 COMPLETE SYSTEM CORPORATE COMPUTERS, INC. 420 Lexington Avenue, New York, N.Y. 10017 (212) 532-1200	WHO IS... The Major Financial Institution Leasing S/360's And S/370's in the U.S. Today? First National Boston (FNB) a top-ranking international financial institution with assets of over \$6.3 billion, is now leasing IBM S/360 and S/370 computers and peripherals through an FNB affiliate, Randolph Computer Company. FNB's entry into computer leasing now provides the solid financial base required for highly flexible short and long-term computer leasing of IBM computers and peripherals by IBM users. During 1972, leasing of S/360 and S/370 CPUs and peripherals saved Randolph's computer-leasing customers over \$42 million in rentals in just one year. These users of Randolph's computers, who number over 200, are distributed across all of the 12 major U.S. industry sectors, with small firms as well as large corporations sharing in cost-saving leases from Randolph. Financial institutions, too — the professional money managers — are well represented among the EDP users who analyzed financial alternatives, then selected the most flexible lease plan for them: a plan designed by RCC for their changing needs. For your up-to-date lease plan, contact RANDOLPH, THE COMPUTER LEASING COMPANY, now: RCC • 537 Steamboat Rd., Greenwich, CT, 06830 (203) 631-4200 • 8060 Montgomery Rd., Cincinnati, OH, 45236 (513) 793-6060 • 530 "B" St., San Diego, CA, 92101 (714) 232-6401
BUY... SELL... LEASE IBM 360/370 For immediate information call collect: In the West — (415) 638-9005 In the East — (516) 466-6500 Or write: 8105 Edgewater Dr. Oakland, CA 94621 11 Grace Ave. Great Neck, New York 11021				

COMPUTERWORLD

BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP
1440 IBM SYSTEM FOR SALE 8K CPU with 1447 console printer 1443 printer 1442 card read/punch 3 - 1311 disk drives Contact: Gene Chevchek Lorain National Bank 457 Broadway Lorain, Ohio 44052 (216) 244-6000	FOR SALE Honeywell 2201-9 CPU With Features - 0191, 1121, 1117, 1115, 220-3, 286-3, 086, 213-4, 285T, (2) 285-5A, (2) 285-1H, (3) 285-1B BIDS ACCEPTED Call: Joe Hnot (516) 466-9500 or Write: Leasco Computer, Inc. One Linden Place Great Neck, New York 11022	WANTED TELETYPE® EQUIPMENT New • Used • Parts — ALSO — • Data Terminals • Peripherals • Mini-Computers • Modems Contact us for data terminal sales, service, supplies and rentals. TERMINAL SYSTEMS INC. 11300 Hartland St. N. Hollywood, Calif. 91605 213-769-6772 TWX 910-499-2675	THE AMERICAN COMPUTER EXCHANGE INC. Specialists in IBM 360/370 Purchase & Lease For information on the EDP equipment exchange service contact: Gary Johnston American Computer Exchange 24500 Chagrin Blvd. Beachwood, Ohio 44122 (216) 464-3881	ACS FOR SALE or LEASE 1440 - 16K BANKING SYSTEM *7335-2 TAPE DRIVE *1311 DISC DRIVES *1403-2 PRINTER *MICR-SORTER RDR. *SOFTWARE REFURBISHED - ON IBM M/O DELIVERED & INSTALLED AVAILABLE OCT. 73 FOR SALE 1440 - 16K BANKING SYSTEM 3 - DISC - 1311's 1412 MICR AVAILABLE THIS FALL ACS Equipment Corporation 8928 Spring Branch Drive Houston, Tx 77055 (713) 461-1333
We Need: 1419 MOD 1 FOR BETTER VALUE LOOK TO: cac COMPUTER ACQUISITIONS COMPANY P O BOX 80572, ATLANTA GA 30341 • (404) 458 4425	Available: 360/50-512K 360/40-64K 360/40-128K 360/40-196K 360/30-32/64K	Current Inventory SALE All this Unit Record Equipment in stock and ready to ship at money saving sale or lease prices. RARELY OFFERED: 046, 029, 059, 407, A3, 548, 557, 087, 088 OTHER FINE MODELS: 024, 026, 056, 077, 085, 402, 403, 407, 514, 519, 523, 552, 602, 604, 521, 826 D.P. Equipment Marketing Corp. 260 W. Broadway, N.Y. N.Y. (212) 925-7737 Ext 1	BEFORE YOU BUY  GO GREYHOUND	BEFORE YOU SELL  GO GREYHOUND
SYSTEM 360/370 A business relationship you can't afford to be without ...	 dearborn computer leasing corporation	 Machines — New, Used • Models 28, 32, 33, 35, 38 • BRPE's • CRT's • Couplers • Enclosures • Modems • 10, 15, 30 CPS Terminals NAT'L TELETYPEWRITER CORP. 23 Cain Dr., Plainview, N.Y. 11803 (516) 293-0444	WANTED 360/65's 360/50's 2030F (1.5 Mic), 2040G, I/O Set, 2314-1. 2314-1's, 1012 Tape Punch. A member of the Computer Lessors Association	FOR SALE 2030F (1.5 Mic), 2040G, I/O Set, 2314-1. 2314-1's, 1012 Tape Punch. A member of the Computer Lessors Association
WE BUY • SELL LEASE • RECONDITION TELETYPE® Machines — New, Used • Models 28, 32, 33, 35, 38 • BRPE's • CRT's • Couplers • Enclosures • Modems • 10, 15, 30 CPS Terminals NAT'L TELETYPEWRITER CORP. 23 Cain Dr., Plainview, N.Y. 11803 (516) 293-0444	WE BUY • SELL LEASE • RECONDITION TELETYPE® Machines — New, Used • Models 28, 32, 33, 35, 38 • BRPE's • CRT's • Couplers • Enclosures • Modems • 10, 15, 30 CPS Terminals NAT'L TELETYPEWRITER CORP. 23 Cain Dr., Plainview, N.Y. 11803 (516) 293-0444	• LEASE • BUY • SELL • 370 360 LEASE PLANS 3 YEARS & LONGER LOWEST RATES THOMAS COMPUTER CORPORATION 625 N. Michigan Ave. Chicago, Illinois (312) 944-1401	• LEASE • BUY • SELL • 370 360 LEASE PLANS 3 YEARS & LONGER LOWEST RATES THOMAS COMPUTER CORPORATION 625 N. Michigan Ave. Chicago, Illinois (312) 944-1401	• LEASE • BUY • SELL • 370 360 LEASE PLANS 3 YEARS & LONGER LOWEST RATES THOMAS COMPUTER CORPORATION 625 N. Michigan Ave. Chicago, Illinois (312) 944-1401
BUY-SELL-LEASE 360/20 360 30/40/50 65  ECONOCOM Division of Cook Industries, Inc. 2185 Democrat Road — P.O. Box 16902 Memphis, Tennessee 38116 901-396-8890 or 901-396-8600	 370 145/155 FOR SALE IBM 407 Data Processing Machine, Maintenance contract, E-6 Model, 40 panels, wires, 3 panel cabinets, and 3 tab card files. \$3,500. (714) 785-2330 General Conference Insurance Service P.O. Box 8007 Riverside, California 92505	 WRIGHT LINE Unitray Trucks for Tab Cards • 60,000 Card Capacity • 24 Trays Per Truck • 53" H X 24" L X 19" W • 2 Tiers Each Side — On Casters • Excellent Condition Cabinet and 24 Trays — \$135.00 Trays Only — \$4.00 Each HARDY BRUSH CORP. 16 Haverhill Street Andover, Massachusetts 01810 Call Collect: (617) 475-4000	 buy • sell • lease • trade 360/370 dataservequipment inc. Call Collect 612-546-4422 Or Write 400 Shelard Plaza, Suite 415 Minneapolis, Minnesota 55426	 FOR SALE 360 Systems 1401 Systems 2400 Tape Drives 2311 Disk Drives 1620 Systems 029, 206, 059 All Types Unit Record Equip. Incl. 082, 083, 402, 407, 514, 519, 557 SALE OR LEASE 360 Systems 1401 Systems 2400 Tape Drives 2311 Disk Drives 1620 Systems 029, 206, 059 All Types Unit Record Equip. Incl. 082, 083, 402, 407, 514, 519, 557 EQUIP. WANTED 360 Systems 1401 Systems Tape Drives All Types of Card Equipment 029, 059, 026
buy • lease • sell 370 & 360 EQUIPMENT CIS PRESENTS ECONOMY IN IBM HARDWARE, and backs it up with an established reputation for service, dependability and a penchant for detail. No loose ends. Personal contact with experience gathered in the field combine to bring you maximum economy and razor sharp performance. Talk to a CIS man now. You know he'll deliver! Branch Offices: HARTFORD, CONN. PITTSBURGH, PA. WASHINGTON, D.C. CIS CONTINENTAL INFORMATION SYSTEMS CORPORATION MIDTOWN PLAZA, SYRACUSE, NEW YORK 13210 (315) 474-5776	 IBM 2314 Model 001 Available Sept. 10, 1973 Call or write Arthur F. Hull Cincinnati Gas & Electric Co. P.O. Box 960 Cincinnati, Ohio 45201 513-632-2763	 SPECIAL SALE 360 (30) System I.O. Set 1620 Disk System 1443 Printer 1401-BK 2311 Disk Drives 729-Tapes • DPA with offices in most major cities now offers IBM equipment completely reconditioned prior to shipment. • Member Computer Lessors Assn. • Call or Write	 dpa D.P.A. INC., 2636 Farrington Street, Dallas, Texas 75107, (214) 637-0950	

BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP	BUY SELL SWAP
<p>LEASE OR SALE IBM 2050 with 3 Selector Channels & 1052 Printer 1 2841 IBM Disc Storage Control 2 2401 IBM Tapes 60,000 BPS 1 Univac 1108 65K System (Avail. the 1st quarter '74) 1 Univac 9200 II 8K Card System 2 Univac 9200 8K Card Systems 1 Univac 1001 Card Controller 1 H-200 16K System with 4-204-4-B Tapes 1 H-203A-3 Tape Control & 205-1 Switch Contact: A.H. Manchester 83 Ridgewood Avenue Glen Ridge, N.J. 07028 (201) 748-8159 (212) 233-4885</p>	<p>FOR SALE 360/65-J 2860-3, 2870-1 with sub channel 4-2365's-2 Available October CALL or WRITE Director of Resale Equipment Greyhound Computer Corp. Greyhound Towers Phoenix, Arizona 85077 (602) 248-5972</p>	<p>For Sale IBM LCS 2361-II WRITE: CW Box 3909 797 Washington Street Newton, Mass. 02160</p>	<p>THE CLC CORNER COMPUTER LEASING COMPANY OFFERS FOR SALE, RENTAL OR LEASE CDC 6400 & 6600 COMPLETE WITH DESIRED PERIPHERALS  Low purchase prices—Buy now, or apply generous rental credits toward purchase. Economical rental/lease plans—Terms to fit your needs, from month-to-month to five years; unlimited usage; maintenance and insurance paid by CLC. Superior quality—Like-new condition; continued maintenance guaranteed. CALL (703) 521-2900 Ask Hayden Williams for name of sales representative nearest you. The men who know their business get their computing equipment from... CLC Computer Leasing COMPANY 2001 Jefferson Davis Highway, Arlington, Va. 22202 • Offices Nationwide</p>	<p>FOR SALE OR LEASE BY OWNER UNIVAC 1108 262 K of 750 Nano sec core 4) 432 Drums and Controller VIII C Tapes and Controller Multiple Comm. Interfaces 3) Intelligent RJE Terminals WILLIAM DIETZ 1 Linden Place, Great Neck, L.I., N.Y. 11021 (516) 487-8610</p>
<p>Available Today BARGAIN MOD 40 128K (all IBM) core, decimal and floating point arithmetic, 2 selector channels, storage protect, and 1052 console. Available for lease from one of our user clients. Call to make us prove that our 12 month rate is the Lowest Price Ever Offered To You for this configuration.</p>	<p>SALE/LEASE 360/20's C1-8K, 1403-7, 2560 A-1 D2-16K, 1442-5, 2501 A-1 - 1403-2 (2) 2311-11, 2415-1 OTHER MODELS AVAILABLE 1401 C 3, 1402-1, 1403-2 360/30's, 40's, 50's with 1/0 sets 370-145's, 155's BUY All model 360/20's, 360/30's, 40's, 50's and 65's 370's and System 3's All peripherals and unit record equipment  360/370 & SYSTEM 3 FINANCING AVAILABLE PHILADELPHIA (215) 568-6620 NEW YORK (516) 487-9812 505 Northern Blvd. Great Neck, N.Y. 11021</p>	<p>360-370 marketplace BUY • SELL • LEASE 360/370 All model 360/20's, 360/30's, 40's, 50's and 65's 370's and System 3's All peripherals and unit record equipment  360/370 & SYSTEM 3 FINANCING AVAILABLE PHILADELPHIA (215) 568-6620 NEW YORK (516) 487-9812 505 Northern Blvd. Great Neck, N.Y. 11021</p>	<p>360-370 marketplace BUY • SELL • LEASE 360-370 All model 360/20's, 360/30's, 40's, 50's and 65's 370's and System 3's All peripherals and unit record equipment  360/370 & SYSTEM 3 FINANCING AVAILABLE PHILADELPHIA (215) 568-6620 NEW YORK (516) 487-9812 505 Northern Blvd. Great Neck, N.Y. 11021</p>	<p>Evergreen Computer and Financial, Inc.  HOME OFFICE: Suite 120 9100 Bloomington Freeway West Bloomington, Minnesota 55431 612/884-9751 2040 G CPU (SN 21353) 3237 DECIMAL ARITHMETIC 4427 FLOATING POINT 6980 FIRST SELECTOR CHANNEL 7520 STORAGE PROTECTION 7920 1052 ADAPTER 1052-7 PRINTER-KEYBOARD (SN 50546) ATTRACTIVE 370 LEASE RATES AVAILABLE</p>
<p>WANTED BURROUGHS L SERIES TC 500 A149, A150 NCR 31-32 42 On Line Call Stuart Hubenstein I.O.A. Data Corp. 383 Lafayette St., N.Y. 10003 (212) 673-9300</p>	<p>WANTED 360 - 30 - F - 15405 1051 - N1 - 51582 1052 - 6 - 61620 1401 - E5 - Tape & Disk System 1401 - C6 - Tape System 029 - B-22's Sale- 1316- Disk Packs- \$20.00 Sale- 2315- Disk Packs- \$35.00 Sale- 2316- Disk Packs- \$75.00</p>	<p>FOR LEASE OR SALE 360 - 30 - F - 16294 1051 - N1 - 52530 1052 - 6 - 66350 2821 - 01 - 16174 2540 - 01 - 11789 1403 - N1 - 36799 1401 - E5 - Tape & Disk System 1401 - C6 - Tape System 029 - B-22's Sale- 1316- Disk Packs- \$20.00 Sale- 2315- Disk Packs- \$35.00 Sale- 2316- Disk Packs- \$75.00</p>	<p>WANTED 360 - 20 - Card System 557's 1403-N1 088's 2540-01 129's 2821-01 DATA AUTOMATION SERVICES, INC. 4858 Cash Road Dallas, Texas 75247 (214) 637-6570</p>	

BUY SELL SWAP	BUY SELL SWAP	TIME FOR SALE	SOFTWARE FOR SALE	SOFTWARE FOR SALE	
SALE or LEASE Short Term Rentals Also Available IBM 047 026 - 05 Receiving Punch With or Without 1001's 082, 552, 514, 026, etc. Computer Resale Exchange, Inc. 1525 New Hampshire Ave., N.W. Washington, D.C. (202) 265-1550	360 * BUY * 370 * SELL * TRADE * LEASE/SUBLEASE * FOR SALE COMPLETE SYSTEM 360/30 64K 2 Channels 1403-N1 PRINTER & 2821-2 2501-B2 1000 CPM READER 2314-A1 6 SPINDLES (Sept.) 4-90KB TAPES & CONTROL AVAILABLE NOW OPTIONAL CONFIGURATIONS AVAILABLE	ILLINOIS NEED TIME 360/65 DOS 512 K with 7080 Emulator 12 Tape Drives 16 2314 Disk Drives On and Off Line Printers Interested in Selling Block Time Five or Seven Days a Week Located in Chicago Central Business District Excellent Physical Facilities Will Provide Office & Storage Call (312) 225-6800, Mr. Zimmer	MMS GENERAL LEDGER is hard at work for over 70 of the biggest US corporations* TO FIND OUT WHAT THEY KNOW THAT YOU DON'T, CALL:	AUTOCODER & SPS TRANSLATED AUTOMATICALLY to BAL & PL/1 THE TOTALTRAN SYSTEM ... The most economical, practical and quickest method of converting to the 3rd and 4th generation. 3 SERVICES OFFERED: 1. 1400 Object to clean source decompilation 2. 1400 Clean source to BAL translation 3. 1400 Clean source to PL/1 translation Contact: W. Small, President CPU CPU MANAGEMENT ADVISORY CORP. 853 Broadway, N.Y. 10003 (212) 777-7722	
ACS HONEYWELL 1200 - 32K 4 - TAPE 2 - DISC AVAILABLE NOW PRICED TO MOVE!! FOR SALE or LEASE or LEASE/PURCHASE	LUNCEFORD & ASSOCIATES Valley View Bank Bldg. Overland Park, Kan. 66212 (913) 381-7272	Time for Sale	COMPUTER TIME AVAILABLE Continental Can Company, Inc. 36 South Wabash Chicago, Ill. 60603 370/145 384K 4-2402 Tape Drives 8-3330 Disk 2-1403 Printer 1-2540 Card Reader/Punch Run under DOS V/M Call D.A. Dalstrom (312) 269-8666	ACCOUNTING IV THE FINEST GENERAL LEDGER AND FINANCIAL REPORTING SYSTEM AVAILABLE	
MAGNETIC TAPE 1600 BPI 800 BPI recerti- uncertified 2400 \$6.00 \$3.50 1200 5.00 3.00 seals thinline thickline IBM Memorex Scotch released from GEOPHYSICAL Archives not work tapes (713) 772-5557 C.A.R.D. 575 Bellaire Blvd. Houston, Texas 77036	NEW JERSEY -WANTED- APPLICATIONS PROGRAMS We have 360/40 OS partitions available connected to nationwide dial-up communications network. May be better and cheaper than time-sharing for you. Call or Write: Bill Brown (201) 569-7711 Graphic Scanning Corp. 99 W. Sheffield Avenue Englewood, N.J. 07631	MASSACHUSETTS  systematic data processing services, inc. IBM 370/155 DATA CENTER OS MVT Release 21.6 15000 Main Storage 3330 and 2314 Disks HASP III Remote Job Entry Private Client Offices Customer Systems Support Courier Service Key Punching Services 24 hours a day, 7 days a week Call Sales Dept. 890-1200 SDPS 400 Totten Pond Road Waltham, Mass. 02154	CATS-A/R OPEN ITEM ACCOUNTS RECEIVABLE Features include: • Billing • Automatic Cash Application • Inventory Interface • Multi-company Systems Schedule Under control of the CATS MASTER Systems Controller, provided FREE with the license of any of the CATS programs. Also available are: Accounts Payable-Cash Requirements, Accounts Receivable-Retail System, and Inventory Recordkeeping. For information contact: Tom Leonard, President COMPUTERWARES INTERNATIONAL P.O. Box 31205, Birmingham, Ala. 35222 - Phone 205/592-6381	informatics inc. Contact: Ron Kupferman 65 Route 4 River Edge, N.J. 07661 New York (212) 564-1258 New Jersey (201) 488-2100	
data sales co. BUY • SELL • LEASE IBM 360/370 SYSTEM 3 MEMORY Call or Write 13200 Penn. Ave. So. Burnsville, Minn. 55337 (612) 890-8838	POPULAR SERVICES, INC. S/370 145-135-125 S/360 50- 40- 30 1287 OPTICAL SCANNER 2671 PAPER TAPE READER ALL SHIFTS (201) 471-2577	ILLINOIS IBM 360/370 USERS Computer Time Available 370/155 2.0 MEG, 8 3330's, 2 2314's, 10 3420 Tapes, RJE, BATCH, TSO 24 Hours-7Days CAN YOU BEAT? 7.2 cents/sec for a 60K region? 360/65 1.5 MEG, 4 3330's, 2 2314's, 10 3420 Tapes 8am-8pm 8pm-8am Not Available \$95/hr. \$60/hr. \$50/hr. \$40/hr. \$40/hr. Weekdays Weekends 12 hr. block weekend 370/135 144K, 1 2314, 4 2311, 6 3420-5 Tapes 8am-8pm 8pm-8am \$85/hr. \$55/hr. \$40/hr. \$35/hr. \$35/hr. \$30/hr. Weekdays Weekends 12 hr. block weekend 370/135 240K, 4 3330's, 1 2314, 6 2401-6 Tapes Rates same as 370/135 above. 64K, 6 2401 Tapes, 5 2311's 8am-8pm 8pm-8am \$45/hr. \$35/hr. \$25/hr. \$25/hr. FOR FURTHER INFORMATION CALL PAUL SARRIS or RON ELLIS (312) 346-1331	CONNECTICUT  COMPUTERISTIC 5 SUBSIDIARY OF UNIROYAL COMPUTER PROCESSING SERVICES 360/65 • 1256K • OS HASP RJE 360/50 360/40 360/30 BATCH PROCESS Call Collect: Cal Gould (203) 573-3000 George Errico (203) 573-2587	Paymaster Remedies x Payroll Problems • a comprehensive payroll system • now serving over 1000 companies • license for as low as \$250 a month • up to 20 customized deductions and/or allowances . . . all with Y-T-D totals • handles piecework, including calculations of make-up pay • accepts input from time cards • accepts input from terminals • integrated job costing • labor distribution • integrates personnel/payroll records • completely compatible with "Honeywell 200 batch" and "IBM 360/370 batch and remote job entry." • available to companies, institutions and service firms under licensing or purchase	ACCOUNTING SYSTEMS • Accounts Receivable • Accounts Payable • General Ledger • Fixed Asset • Sales Analysis • Report Writer More than 80 companies are successfully and profitably using these valuable management tools. For immediate information, call collect to the office nearest you.
FOR SALE OR LEASE 024-\$350; 026-\$1300; 056-\$250; 077-\$550; 082-\$1,000; 083-\$2900; 085-\$1800; 088-\$5200; 402-\$1300; 403-\$1500; 407-\$3500; 514-\$1300; 519-\$1600; 548-\$2300; 552-\$1500; 557-\$3700; 602-\$400; 2311 (1) \$5000; 729 (5) \$2500; 729 (6) \$3000; 1448 (1) \$1000; 1401 systems \$17,500 & \$35,000. THOMAS COMPUTER CORP. 625 N. Michigan-Suite 500 Chicago, Ill. 60611 (312) 944-1401	Software for Sale TAXBREAK Payroll tax calculation module Calculates payroll withholding taxes for 50 states, federal, FICA and cities. COBOL. \$875 complete. Maintenance service on tax changes available for \$225 per year.	COMTECH the computer package people P.O. Box 784 Reston, Va. 22070 Telephone (703) 471-7141			
MOVING? Please notify Computerworld at least four weeks in advance. When writing about your subscription, please enclose a recent mailing label. The code line on top may not mean much to you, but it is the only way we have of quickly identifying your records. If you are receiving duplicate copies, please send both labels. 797 Washington Street Newton, Massachusetts 02160	COMPUTER RESEARCH COMPANY Largest Computer Time Sales Company	ARGONAUT INFORMATION SYSTEMS, INC. POST OFFICE BOX 112 WALNUT CREEK, CA. 94596 (415) 937-4675			

* WANTED *

Firms to: Buy
Sell
Lease
Sub-Lease → 360 Systems

Write or Call Collect — Today
It's our only business

NVC COMPUTER SALES, INC.
Suite 616, Benjamin Fox Pavilion
Jenkintown, Pa. 19046 • (215) 887-5404

**McCormack & Dodge
Corporation**

Has
DEVELOPED
MARKETED
MAINTAINED

Accounting-oriented software products over the past five years.

Over 400 companies in the U.S. are using one or more of the following:

Fixed Asset Analysis & Accounting System
Accounts Receivable System
Investment Analysis System

McCormack & Dodge Corporation

One Wells Avenue
Newton, Massachusetts 02159
(617) 965-3750

Cites Decline in Sales to Lessors

Telex Posts \$13.4 Million Loss for Year

TULSA, Okla. — Telex Corp. incurred a \$13.4 million loss for the year ended March 31, and cited as a major factor the lower level of sales to leasing companies by the Computer Products subsidiary.

Sales by the unit totaled \$8.2 million compared with \$31.7 million in 1972. However, the sales value of equipment placed with customers during the year rose to \$98.1 million from \$60.3 million the year before.

Other factors contributing to the loss included a \$4.5 million loss from European operations and year-end adjustments in the Computer Products subsidiary, according to President S.J. Jatras.

The \$13.4 million loss compares with earnings of \$1.3 million or 12 cents a share in 1972.

Revenue during the recent year dropped to \$68.1 million from \$73.9 million.

Lease income for the year totaled \$12.5 million compared with \$9.7 million a year ago. "This increase reflects in part the reduced level of leasing com-

pany sales," the company said.

Telex Communications, Inc., organized as a wholly owned subsidiary effective July 1, and Waters Conley Co., which originally comprised the Telex Communications Group, reported increased revenues and profits, the firm said.

Revenues reached \$23.3 million compared with \$22.9 million last year.

As of March 31, Telex had orders for sale or lease of equipment having a sales value of \$27.2 million compared with \$43.1 million a year ago, the firm said.

**Record Fourth Quarter Paces DEC
To Banner Year, Earnings up 54%**

MAYNARD, Mass. — Digital Equipment Corp.'s record fourth quarter paced the company to its best fiscal year, with earnings climbing 54% on a 42% income rise in the year ended June 30.

Minicomputer shipments reached their highest level during the last quarter and shipments exceeded 1,000 units per quarter in the PDP-8 and PDP-11 families, lifting total installations to over 25,000, the company said.

A major portion of the demand was attributed to the OEM market. Other strong areas were data communications, industrial and laboratory, the firm said.

The large Decsystem-10 further strengthened its position in the time-sharing utility, commercial and educational markets during the year, DEC said.

"We see continued growth for the Decsystem-10 and expect it to be a major product line for the foreseeable future," commented President Kenneth H. Olsen.

In the quarter, earnings rose 53% to \$9.3 million or 85 cents a share compared with \$5.1 million or 49 cents a share in the same 1972 period.

Revenues reached \$86.3 million compared with \$56.5 million a year ago.

For the year, earnings totaled \$23.5 million or \$2.16 a share compared with \$15.3 million or \$1.49 a share in 1972.

Revenues rose to \$265.5 million from \$187.6 million in 1972.

During the year, Digital hired more than 5,000 manufacturing, field service and administrative personnel, bringing worldwide employment to about 13,000, Olsen said.

Itel Half, Quarter Show Earnings

SAN FRANCISCO — Bolstered by a strong second quarter, Itel Corp. reported earnings in both the quarter and the half com-

pared with losses in the year-ago periods.

President Peter S. Redfield said he expects the largest portion of Itel's operating revenues will come in the second half of the year.

In the quarter, earnings rose to \$1.8 million or 23 cents a share compared with a loss of \$1.3 million or 17 cents a share in the year-ago period.

Revenues more than doubled to \$44.1 million from \$20.1 million in the previous year's quarter.

In the six months, earnings rose to \$2.5 million or 33 cents a share compared with a loss of \$2.8 million or 38 cents a share in the same 1972 period.

Revenues reached \$77.4 million compared with \$39.6 million.

"These results reflect the strong operating momentum that has been built up throughout the company since late 1972," Redfield observed, adding, they do not reflect the agreement to sell the Information Storage Systems Division to Univac.

During the second quarter Itel formed a new subsidiary, called SSI Navigation, Inc., a ship operating and chartering company.

**ADR Revenues, Net
Rise in Six Months**

PRINCETON, N.J. — Applied Data Research, Inc. scored record revenues and improved earnings for the six months ended June 30.

The company has shown improved profits for the last three consecutive quarters, according to President John R. Bennett. In each of these periods, software product sales exceeded \$1 million, he noted.

Earnings for the half year climbed to \$136,527 or 12 cents a share compared with \$94,103 or 10 cents a share in the same 1972 period, which has been reclassified.

Revenues reached \$5.1 million, up from \$4.4 million in the year-ago period.

Acquisitions

Tektronix Inc. has agreed to acquire Grass Valley Group Inc., supplier of television line and terminal equipment, for about 500,000 shares of Tektronix common.

Commerce Clearing House, Inc. (CCH) and its majority-owned subsidiary, Computax Services, Inc., have agreed in principle to a merger of Computax into CCH. Terms of the agreement call for the issuance of 330,150 shares of CCH common in exchange for the 660,300 shares of Computax common not presently held by CCH.

Itel Corp. has agreed in principle to acquire D.C.S. Computer Services, a New York-based service company, for an undisclosed amount of cash.

Penril Data Communications, Inc. has reached an agreement to acquire substantially all of the business and assets of the Electro-Metrics Division of Fairchild Camera and Instrument Corp. for an undisclosed amount of cash.

Scientific Software Corp. and Brooks Monroe and Co., Inc. have reached general agreement for the sale of Education and Economic Systems, Inc. to Brooks Monroe.

Control Data Corp. has acquired the operating assets and business of Greenwich Data Systems, Inc., a wholly owned subsidiary of Planning Research Corp., Los Angeles, for an undisclosed price.

On-Line Services

Expand your business using our Dual DEC System-10 with nationwide dial access as your own computer center supporting your applications and customer base.

We offer:

- Attractive rates
- Your own custom sign-on message
- Protected group libraries
- Technical support
- Flexible business terms

Do you have an on-line application package looking for a distribution vehicle?

Do you have a batch application suitable for on-line use?

Does your company perform a computerized function which may be of interest to others in your industry?

For details, write:

Teleplex Marketing Manager
APPLIED DATA RESEARCH
Route 206 Center, Princeton, New Jersey 08540
Telephone: (609) 921-8550



Earnings Reports

CINCINNATI MILACRON

Three Months Ended June 16

	1973	1972			
Shr Ernd	\$61	\$5	Shr Ernd	\$37	\$32
Revenue	86,105,482	64,174,916	Revenue	3,442,884	2,347,090
Earnings	2,265,019	244,050	Earnings	293,146	200,926
6 Mo Shr	1.16	...	SINGER		
Revenue	168,428,339	123,210,587	Three Months Ended June 30		
Earnings	4,309,334	(130,444)	1973	1972	
	(000)	(000)			

SCIENTIFIC COMPUTERS

Nine Months Ended March 31

	1973	1972			
Shr Ernd	\$13	\$16	Shr Ernd	\$1.21	\$1.04
Revenue	2,802,061	2,667,428	Revenue	619,745	552,271
Earnings	106,112	129,944	Earnings	21,469	19,311

MACRODATA

Six Months Ended June 30

	1973	1972			
Shr Ernd	\$1.21	\$1.04	Three Months Ended June 30		
Revenue	1,196,531	1,077,131	1973	1972	
Earnings	42,415	38,026	(000)	(000)	

DATA 100

Three Months Ended June 30

	1973	a1972
Shr Ernd	\$25	...
Revenue	9,437,000	\$2,195,000
Tax Cred	347,000	...
Earnings	722,000	(1,867,000)
6 Mo Shr	.42	...
Revenue	17,091,000	3,782,000
Tax Cred	579,000	...
Earnings	1,226,000	(3,938,000)

a-Restated for accounting changes.

IBM Computer Systems & Unit Record Machines

360

LEASE

370

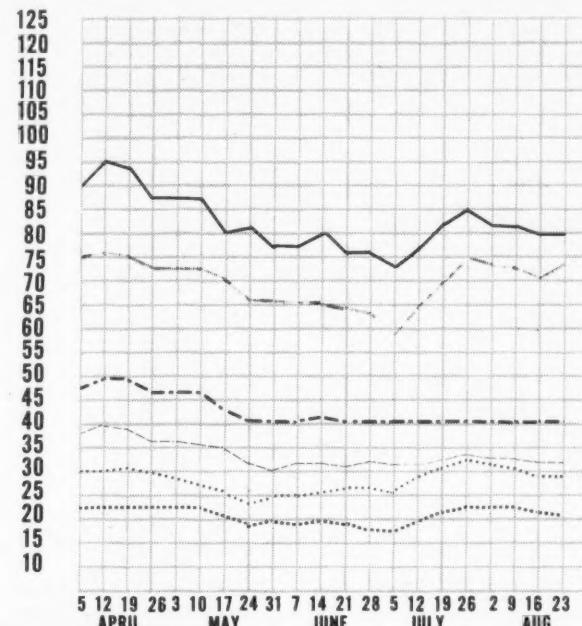
LEASE PLANS
3 YEARS & LONGER
LOWEST RATESyou owe it to your company to
get the lower Datronic quote.

d datronic

5210 Wesley Terrace
Chicago, Ill. 60656
Phone Area 312-922-0760

COMPUTERWORLD Computer Stocks Trading Indexes

— Computer Systems ----- Software & EDP Services
----- Peripherals & Subsystems ----- Leasing Companies
----- Supplies & Accessories ----- CW Composite Index



DATA 100

Three Months Ended June 30

	1973	a1972
Shr Ernd	\$25	...
Revenue	9,437,000	\$2,195,000
Tax Cred	347,000	...
Earnings	722,000	(1,867,000)
6 Mo Shr	.42	...
Revenue	17,091,000	3,782,000
Tax Cred	579,000	...
Earnings	1,226,000	(3,938,000)

a-Restated for accounting changes.

DOCUTEL

Three Months Ended June 30

	1973	1972
Shr Ernd	\$50	\$16
Revenue	10,770,000	4,914,000
Tax Cred	1,155,000	322,000
Earnings	2,428,000	693,000
6 Mo Shr	.93	.24
Revenue	19,605,000	9,232,000
Tax Cred	2,204,000	498,000
Earnings	4,554,000	1,046,000

a-Adjusted for two-for-one stock split in June 1972.

RAPIDATA

Three Months Ended June 30

	1973	1972
Shr Ernd	\$11	\$14
Revenue	2,248,191	2,014,744
Earnings	206,901	264,376
6 Mo Shr	.27	.24
Revenue	4,552,721	3,718,510
Earnings	498,284	452,735

a-Adjusted for two-for-one stock split in June 1972.

STANDARD REGISTER

Three Months Ended July 1

	1973	a1972
Shr Ernd	\$57	\$44
Revenue	31,214,791	27,095,854
Spec Cred	...	b128,889
Earnings	1,242,640	953,378
6 Mo Shr	1.04	.71
Revenue	60,315,776	53,044,451
Spec Cred	...	b128,889
Earnings	2,248,076	1,528,765

a-Restated. b-Gain on sale of property.

WANGCO

Three Months Ended June 30

	1973	1972
Shr Ernd	\$27	\$21
Revenue	2,911,383	1,277,772
Tax Cred	...	93,605
Earnings	295,274	187,392
9 Mo Shr	.74	.34
aSpec Cred	63,300	100,105
Earnings	792,972	264,544

a-In 1973, tax credit; in 1972, tax credit less loss from discontinuance of subsidiary.

STORE MORE. PAY LESS.

IBM 3360's

More storage for your 370/155 or 370/165 at much less cost. Lease 1 to 5 years or purchase. Delivery guaranteed to meet your specific needs.

alanthus

alanthus Corporation
77 Tarrytown Road
White Plains, New York 10607For further information,
call (914) 428-3703 or write:

Name _____
Title _____
Company _____
Address _____
City _____
State _____ Zip _____
Phone No. _____



TRADE QUOTES

Computerworld Stock Trading Summary

All statistics compiled,
computed and formatted by
TRADE QUOTES, INC.
Cambridge, Mass. 02139

E	PRICE	E	PRICE	E	PRICE
X	1973	X	1973	X	1973
C	RANGE	C	RANGE	C	RANGE
COMPUTER SYSTEMS					
N BURROUGHS CORP	211-245	223	7/8	- 7/8	- 0.3
N COLLINS RADIO	16- 26	25	1/8	+ 3/8	+ 1.5
O COMPUTER AUTOMATION	5- 16	9	3/4	- 1/8	- 10.3
N CONTROL DATA CORP	31- 62	35	3/8	+ 1/4	+ 5.2
O DATA GENERAL CORP	28- 46	39	3/4	+ 1/4	+ 3.2
O DATAPOINT CORP	10- 21	9	3/4	- 1/4	- 2.5
O DIGITAL COMP CONTROL	2- 6	2	3/4	- 1/2	- 15.3
N DIGITAL EQUIPMENT	73-105	88	5/8	+ 3/4	- 0.8
N ELECTRONIC ASSOC.	4- 9	4	3/8	- 1/4	- 5.6
A ELECTRONIC ENGINEER.	6- 11	9	3/8	- 1/4	- 2.5
N FOXBORO	23- 36	35	1/2	- 7/8	- 2.4
O GENERAL AUTOMATION	27- 55	33	1/4	- 1/4	- 0.7
N GRI COMPUTER CORP	1- 3	1	3/8	+ 1/8	+ 10.0
N HEWLETT-PACKARD CO	73- 95	77	3/4	- 3	- 3.7
N HONEYWELL INC	98-139	105	7/8	+ 0.8	
N IBM	298-340	299	1/4	- 1 1/4	- 0.4
O INTERDATA INC	7- 13	8	0	0.0	
N MEMOREX	2- 19	4	7/8	0	0.0
O MICRODATA CORP	2- 10	2	3/4	- 1/4	- 8.3
N NCR	27- 38	34	1/2	+ 1/4	+ 0.7
N RAYTHEON CO	22- 26	25	1/4	+ 7/8	+ 3.5
N SINGER CO	45- 74	48	2	- 2	- 5.6
N SPERRY RAND	36- 50	47	7/8	+ 2 3/8	+ 5.2
A SYSTEMS ENG. LABS	3- 8	3	1/2	0	0.0
N TFXAS INSTRUMENTS	83-110	103	5/8	+ 2 1/2	+ 2.4
N ULTRAMAC SYSTEMS INC	1- 11	3	0	0.0	
N VARTAN ASSOCIATES	10- 20	12	3/8	- 1/8	- 1.0
N WANG LABS.	13- 34	19	3/8	- 1 7/8	- 8.8
N XEROX CORP	141-169	150	1/8	- 1/8	0.0
LEASING COMPANIES					
A BOOTHE COMPUTER	1- 5	1	1/8	- 1/8	- 10.0
O BRESNAHAN COMP.	1- 2	2	0	0.0	
O COMDISCO INC	6- 17	6	1/4	- 1/2	- 7.4
O COMPUTER GROUP CORP	3- 4	3	1/2	0	0.0
O COMPUTER EXCHANGE	1- 1	1	1/4	- 1/4	- 50.0
A COMPUTER INSTRNS GRP	2- 8	2	5/8	- 1/8	- 4.5
O COMP. INSTALLATIONS	1- 2	1	0	0.0	
M DATRONIC RENTAL	2- 3	2	1/4	+ 1/4	+ 12.5
A DCL INC	1- 3	1	0	- 1/8	- 11.1
A DEARBORN-STORM	12- 26	14	1/2	- 2 3/4	- 15.9
N DPF INC	5- 9	4	7/8	- 3/8	- 7.1
O EDP RESOURCES	1- 3	1	1/2	- 1/8	- 7.6
A GRANITE MGT'	2- 6	2	3/4	- 1/2	- 15.3
A GREYHOUND COMPUTER	3- 6	3	3/4	- 1/8	- 3.2
A ITEL	4- 12	4	7/8	- 1/8	- 2.5
N LEASCO CORP	8- 18	10	1/2	- 1/4	- 2.3
O LEASPC CORP	2- 8	2	1/8	- 3/8	- 15.0
O LECTRO MGT INC	1- 2	1	1/4	0	0.0
N NRG INC	5- 15	4	3/4	+ 1/8	+ 2.7
A PIONEER TEX CORP	5- 8	4	5/8	0	0.0
A ROCKWOOD COMPUTER	1- 3	1	1/8	- 1/8	- 10.0
N U.S. LEASING	16- 36	21	1/8	- 1/4	- 1.1
PERIPHERALS & SUBSYSTEMS					
N ADDRESSOGRAPH-MULT	12- 34	12	- 1	- 7.6	
O ADVANCED MEMORY SYS	5- 23	6	0	0.0	
N AMPEX CORP	4- 7	5	+ 1/8</		

**This year, minicomputer
users plan to buy more
Hazeltine CRT terminals
than any other...
more than twice the
nearest competitor!***



*1973 Minicomputer
Market Survey
by Modern Data
magazine.

Why not try a Hazeltine terminal on your mini?
Call us for an on-site demonstration.

Hazeltine Corporation Computer Peripheral Equipment Greenlawn, N.Y. 11740 (516) 549-8800 Telex 96-1435

EAST: NEW YORK (212) 586-1970 □ BOSTON (617) 261-5867 □ EDISON, N.J. (201) 828-5678 □ PHILADELPHIA (215) 676-4348 □ PITTSBURGH (412) 343-4449
WASHINGTON, D.C. (703) 979-5500 □ ROCHESTER (716) 852-6570

MIDWEST: MINNEAPOLIS (612) 854-6555 □ CHICAGO (312) 986-1414 □ CLEVELAND (216) 752-1030 □ DETROIT (313) 355-3510

SOUTH: DALLAS (214) 233-7776 □ ATLANTA (404) 252-2045 □ GREENSBORO, N.C. (919) 855-0307 □ HOUSTON (713) 783-1760 □ ORLANDO (305) 423-1201

WEST: SAN FRANCISCO (415) 398-0686 □ DENVER (303) 770-6330 □ LOS ANGELES (213) 553-1811 □ SEATTLE (206) 242-0505

IN CANADA: CAE ELECTRONICS, LTD. (514) 341-6780

FOR WORLDWIDE SALES INFORMATION CALL: (516) 549-8800



HAZELTINE AND THE PURSUIT OF EXCELLENCE